SCIENCE

VOL. 90 FRIDAY, JULY 21, 1939 No. 2325

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SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. MCKEEN CATTELL and published every Friday by

THE SCIENCE PRESS

New York City: Grand Central Terminal

Lancaster, Pa. Garrison, N. Y.

Annual Subscription, $6.00 Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary in the Smithsonian Institution Building, Washington, D. C.

THE MILWAUKEE MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Edited by Dr. F. R. MOULTON

PERMANENT SECRETARY

FOR the second time in its history the American Association for the Advancement of Science held a meeting in Wisconsin. The first meeting in Wisconsin was held in Madison from August 17 to August 22, 1893; the recent meeting in Milwaukee was held from June 19 to June 24, 1939. The proximity of Milwaukee to Chicago with its several great educational institutions and its unsurpassed accessibility by railroads has obviously prevented its being selected hitherto as a meeting place for the association. It is delightfully located, however, on the shores of Lake Michigan and has ample facilities for a very large convention.

In 1893, at the time of the meeting in Madison, there were 1,982 members of the association; at the time of the meeting in Milwaukee there were 20,310 members. The attendance at the meeting in Madison was 290; at Milwaukee, about 700. There were 168 papers presented at Madison, and 264 papers and addresses at Milwaukee. In comparing these statistics of attendance and papers it should be remembered that the regular annual meeting of the association was held at Madison, while only a summer meeting was held in Milwaukee.

Although many of the programs presented in Milwaukee were of a very high order of excellence, the attendance was low, only about a third of that at the meeting in Ottawa a year ago. It is a question whether there are not so many meetings of scientists that general summer meetings of the association fail to justify their cost in effort and money. Possibly the association

would better fulfil its purpose of advancing the interests of science and society if, instead of holding general summer meetings of all sections, it would arrange for those sections and affiliated societies which find it advantageous to have summer programs to hold special regional meetings in connection with universities and other organizations.

REGISTRATION

Although about 700 persons were in attendance at the meeting, only 331 registered and secured the General Program of all sessions and events. The registrants were distributed as follows: Alabama, 1; Arkansas, 1; California, 5; Colorado, 1, Connecticut, 3; Washington, D. C., 18; Georgia, 1; Idaho, 1; Illinois, 58; Indiana, 4; Iowa, 8; Kansas, 2; Maine, 1; Massachusetts, 10; Michigan, 21; Minnesota, 17; Missouri, 13; Nebraska, 1; New Jersey, 6; New Mexico, 1; New York, 20; North Carolina, 1; North Dakota, 1; Ohio, 13; Oklahoma, 1; Oregon, 1; Pennsylvania, 7; Rhode Island, 1; South Dakota, 2; Vermont, 1; Wisconsin, 48; Milwaukee, 60; Foreign and Unknown, 4.

GENERAL SESSIONS

On June 20 the eighth Hector Maiben Lecture was delivered by Dr. Victor G. Heiser, distinguished author of "The Odyssey of an American Doctor," on "The Influence of Nutrition on the Diseases of Middle and Old Age." A large and appreciative audience listened attentively to Dr. Heiser's exposition of some of the astonishing consequences of unbalanced diet.

On Wednesday evening, June 21, Dr. Heber D. Curtis, director of the observatories of the University of Michigan, delivered a lecture, illustrated by motion pictures, on "Solar Storms." The motion pictures, taken with the remarkable apparatus developed at the McMath-Hulburt Observatory, showed most astounding phenomena taking place on the sun. The large audience sat in awe before pictures of great masses of flaming gas, thousands of times greater in volume than the earth, shooting up from the surface of the sun tens of thousands of miles and, strangely, often shooting down with comparable velocities. Indeed, the photograph of one eruption was shown that ascended to a height of over 600,000 miles.

The third conference on "Science and Society" presented a program of four general sessions on "The Economic System in Relation to Scientific Progress." The program is given in the report of the Section on Social and Economic Sciences below.

SYMPOSIA

Eleven symposia were presented at the meeting, in addition to a symposium at Madison under the sponsorship of the Division of Physical and Inorganic Chemistry of the American Chemical Society and the University of Wisconsin, in cooperation with the Section on Chemistry (C).

1. The Section on Geology and Geography (E) held a joint symposium with the American Society of Agricultural Engineers, the Section on Engineering, Association of American Geographers and the Geological Society of America on "Soil Conservation and Land Utilization in the Great Lakes Region," at which 14 papers were presented in two sessions. The contributions were by M. L. Nichols and Bruno Klinger, C. F. Stewart Sharpe, Eugene I. Roe, T. M. Bushnell, Otto E. Guthe, A. H. Paschall, Dallas E. Perfect, E. A. Norton, Paul M. Barrett, F. P. Struhsaker, W. F. Ramsdell, A. R. Whitson, L. B. Thomson and Louis A. Wolfanger.

2. The Section on Zoological Sciences (F) presented a symposium on "The Relation of Genetics to Geographical Distribution and Speciation," under the chairmanship of L. J. Cole, who opened the symposium with introductory remarks. The discussions were by Carl L. Hubbs, M. R. Irwin and R. W. Cumley, A. H. Sturtevant, L. R. Dice, and Alfred C. Kinsey.

3. The Section on Zoological Sciences (F) presented also a second symposium on "Regeneration," under the chairmanship of J. W. Buchanan, who opened the symposium. The papers of this symposium were presented by W. C. Curtis, Olin Rulon, William Balamuth, L. H. Hyman, and the session closed with a tribute to H. V. Wilson by W. C. Curtis.

4. The Section on Botanical Sciences (G) in a joint session with the Ecological Society of America, the Society of American Foresters and the Section on Agriculture (O) presented a symposium on "Socio-economic Approach to Land Use," under the chairmanship of L. R. Schoenmann. The participants were Aldo Leopold, K. C. McMurry, G. S. Wehrwein and Raphael Zon.

5. The American Society of Plant Physiologists in joint session with the Section on Botanical Sciences (G) and the American Phytopathological Society presented a symposium on "Photoperiodism," at which the speakers were W. F. Loehwing, Karl C. Hamner, R. H. Roberts and B. Esther Struckmeyer.

6. The Section on Psychology (I) presented a symposium on "Measuring Attitudes," one section of which was under the chairmanship of Stephen M. Corey and the other of which was under the chairmanship of Gilbert J. Rich. At the former, the speakers were Maurice Newburger, Louis D. Goodfellow, David A. Grant and Herbert I. Meyer, Delton C. Beier, and H. Wilkes Wright.

7. The Section on Psychology (I) presented also a symposium on "Neuromuscular Tension," under the chairmanship of Edmund Jacobson.

8. The Section on Social and Economic Sciences (K) presented a broad symposium on "Population

Problems and Programs in the Northern Lake States," under the direction of an organizing committee consisting of Warren S. Thompson, E. P. Hutchinson and Stanley D. Dodge. The first part on "The Settlement of the Northern Lake States" was presented in joint session with the Population Association of America and the Ecological Society of America, under the chairmanship of Stanley D. Dodge. Papers were presented by Glenn T. Trewartha, W. Bruce Dick and Guy-Harold Smith.

The second part, on "Population Capacity under Different Forms of Land Use," was presented in joint session with the Population Association of America and the Ecological Society of America. E. P. Hutchinson was chairman and the speakers were Charles M. Davis, Stanley D. Dodge and Raphael Zon.

The third part, on "State and Regional Planning," was presented in joint session with the Population Association of America, under the chairmanship of Warren S. Thompson. The contributors were Samuel Teper, George Wehrwein and M. W. Torkelson.

The fourth part, on "Population Adjustment through Migration," was presented in joint session with the Population Association of America, under the chairmanship of Conrad Taeuber. Papers were read by C. E. Lively, Ray E. Wakeley and J. F. Thaden.

The fifth part, on "Regional Differentiation of Culture Patterns," was presented under the chairmanship of C. E. Lively, at which A. R. Magnus, Philip Beck and George W. Hill presented papers.

The sixth part, on "Agricultural Policies and Programs of the Federal Government," was presented under the chairmanship of Warren S. Thompson. The participants were C. C. Taylor and H. R. Tolley.

The final session on "Evaluation of Federal Policies and Programs" was held under the chairmanship of R. C. Smith, and papers were presented by Lowry Nelson, T. W. Schultz and Noble Clark.

9. The Section on Medical Sciences (N) in cooperation with the American Neisserian Medical Society organized and presented a comprehensive symposium on "Gonococcus and Gonococcal Infection."

The first session was on "The Biology of the Gonococcus," at which papers were presented by Gaylord W. Anderson, Alden K. Boor, N. S. Ferry, Michael Wisengrad, C. Philip Miller, Wesley W. Spink and Alfred Cohn. The subject of the second session was "The Diagnosis of Gonococcal Infection." The contributors to the discussion of this subject were Christine E. Rice, Annis E. Thomson and Agnes C. Hamann, Charles M. Carpenter, Oscar F. Cox and William A. Hinton, Adolph Jacoby, Walter M. Brunet, J. Albert Key, Sara E. Branham, and C. L. Martin.

"Sulfanilamide and Related Compounds" comprised the third session, with papers by Ralph R. Mellon and Lawrence E. Shinn, Charles M. Carpenter and Gerald M. Barbour, Ruth A. Boak, Cassius J. Van Slyke, Percy S. Pelouze, J. F. Mahoney and Anna Nimelman, Nathaniel Jones and Stafford L. Warren, Reuel A. Benson, Roger W. Barnes and H. M. Elliott, and Russell D. Herrold.

At the final session on "Therapy and Control" the papers were by Ruth Boring Thomas, Rogers Deakin, Eleanor L. Adler, Arthur Steer and Irving Weinstock, N. A. Nelson, Robert S. Westphal, W. A. Brumfield, Jr., and R. A. Vonderlehr.

10. The Subsection on Pharmacy of the Section on Medical Sciences presented a symposium on "Vitamins with particular reference to their Standardization." The speakers were Aaron Arnold, P. H. Phillips, C. A. Elvehjem, W. D. Woolley, A. Black and Mrs. Flemintine P. Dann.

11. The Society of American Foresters presented a symposium on "Forest Rehabilitation in the Lake States," the first session being under the chairmanship of T. Schantz-Hansen, at which papers were read by Ray Bassett, H. Basil Wales, Russell N. Cunningham and George Banzhaf. At the second session, under the chairmanship of Henry Schmitz, papers were read by O. W. Swan, William Heritage, F. H. Eyre and D. M. Matthews.

RADIO PROGRAMS

Radio programs were arranged by Dr. John D. Ball for all the three broadcasting stations located in Milwaukee. Paul B. Sears, in cooperation with John D. Ball, Jr., H. H. Remmers, Frank A. Thone and F. R. Moulton, delivered broadcasts over station W.T.M.J.; Otto Struve and J. J. O'Neill in cooperation with John D. Ball, over station W.T.S.N.; E. P. Hutchinson and F. R. Moulton, over station W.E.M.P.

SCIENTIFIC SESSIONS

SECTION ON PHYSICS (B): AMERICAN METEOROLOGICAL SOCIETY

(From the program of the society)

The American Meteorological Society, under the presidency of Robert E. Horton, held four sessions on Monday, June 19, and Tuesday, June 20, at which 22 papers were presented. The contributions at the first session were by Eric R. Miller, John G. Albright, Eugene D. Emigh, George W. Mindling, L. Walter Dick and Winston Manning. The first two papers were historical and biographical subjects. At the second session, which was devoted mostly to hydrographic problems, the speakers were R. H. Musser, William E. Barron, Albert D. Sanial and Norman A. Matson, Bertram S. Barnes, and LeRoy K. Sherman. The papers read before the third session were partly on relations of meteorology to airplane flights and partly on solar radiation. The contributors were Paul

A. Gareau, Homer W. Ball, Arthur M. Marks, Jr., Eugene D. Emigh, Irving F. Hand, L. F. Miller, and R. H. Roberts and B. Esther Struckmeyer. At the final session papers were presented by Charles F. Brooks and Leslie R. Bean, and two motion pictures were shown, one on forecasting floods on the Potomac and Ohio Rivers and the other on exploring the upper air.

SECTION ON CHEMISTRY (C)

(From report by Neil E. Gordon)

Section C cooperated with the Division of Physical and Inorganic Chemistry of the American Chemical Society in a symposium on "The Kinetics of Homogeneous Gas Reactions," which was presented at Madison, Wisconsin, from June 20 to June 22, inclusive. The speakers at the first session, over which George Scatchard presided, were Everett Gorin, Walter Kaufmann, John Walter and Henry Eyring, Eugene P. Wigner, and J. A. Christiansen. At the second session, Farrington Daniels presiding, papers were presented by George Scatchard, K. F. Bonhoeffer, K. H. Geib and O. Reitz, F. O. Rice and K. F. Herzfeld, and H. A. Taylor and Milton Burton. Harold C. Urey presided at the third session, at which papers were read by O. K. Rice and Hallock C. Campbell, Guenther von Elbe and Bernard Lewis, and R. H. Crist and J. E. Wertz. At the fourth session, S. C. Lind presiding, the contributors were G. B. Kistiakowsky and W. W. Ransom; Richard A. Ogg, Jr., and W. J. Priest, Robert W. Pease, and Farrington Daniels and Preston L. Veltman. Philip A. Leighton presided at the final session at which papers were presented by W. Albert Noyes, Jr., and F. C. Henriques, Jr., G. K. Rollefson and D. C. Grahame, E. W. R. Steacie and Roger Potvin, and S. C. Lind. Each session was followed by a general discussion.

SECTION ON ASTRONOMY (D)

(From report by Harlan T. Stetson)

Meetings of Section D were held on Wednesday and Thursday, June 21 and 22, at which the vice-president and chairman of the section, Everett I. Yowell, presided. At the session on Wednesday the contributions were on a variety of topics in several fields of astronomy and astrophysics. John A. O'Keefe, of the Yerkes Observatory, presented evidence that carbon dust periodically emitted from the star R Coronae Borealis causes the variation in brightness of that well-known variable, while Otto Struve, director of the Yerkes Observatory, discussed the chemical composition of interstellar gas. An unusual nebula with a cometary-like appendage was brought to the attention of astronomers by John Titus, of the Yerkes Observatory. Paul Herget, of Cincinnati, gave his recent results on the satellite system of Jupiter. These papers were typical of the program, which included altogether fourteen contributions in the fields of astronomy and astrophysics. About 60 persons were in attendance in Milwaukee.

On the invitation of Dr. Struve, about 70 persons gathered at the Yerkes Observatory on the shores of Lake Geneva, in Wisconsin, for the Thursday session. Dr. Struve addressed the assembly on the topic, "The Yerkes Observatory Looks to the Future," and Dr. Ross, of the observatory staff, spoke on the history and the development of optics in astronomy, including the solution of many problems in connection with the construction of the 100- and 200-inch telescopes in California. A very pleasant tea at the director's residence, by invitation of Dr. and Mrs. Struve, followed the scientific session in the observatory. Opportunity was afforded those who remained over into the evening to examine selected objects through the 40-inch Yerkes telescope. Participating in the program with the members of Section D were delegations from the Milwaukee and the Chicago Astronomical Societies.

SECTION ON GEOLOGY AND GEOGRAPHY (E), GEOLOGICAL SOCIETY OF AMERICA AND ASSOCIATION OF AMERICAN GEOGRAPHERS

(From report by Howard A. Meyerhoff)

The Section on Geology and Geography (E), meeting jointly with the Geological Society of America, was in continuous session from June 15 to 24. Section activities started with a preconvention field excursion in northern Michigan under the able leadership of R. M. Dickey and Kiril Spiroff, of the Michigan College of Mining and Technology. Despite a comparatively small party and consistently bad weather, three effective days were spent examining the pre-Cambrian and Cambrian rock sections of the Marquette and Gogebic ranges and of the Keweenaw Peninsula. The relationships of rocks and mineralization to the mining activities of the Upper Peninsula received special attention, and brief stops were made at the museum of the College of Mining and Technology and at several mines and mills.

At the opening session in Milwaukee on Monday, June 19, Dr. Ira Edwards, of the Milwaukee Public Museum, presided over a short program devoted chiefly to papers on pre-Cambrian geology. Tectonic and glacial problems constituted the subjects for discussion on Monday afternoon, when Rollin T. Chamberlin, of the University of Chicago, occupied the chair. The glacial papers furnished an excellent background for the field excursion scheduled for Tuesday, when F. T. Thwaites, of the University of Wisconsin, led a small party over the moraines and outwash of southeastern Wisconsin. Problems of correlation and dating were stressed, and those participating were as much impressed with the details of glaciation, which must

still be worked out, as with the vast amount of expert work already done.

Kirk Bryan, vice-president of the American Association and chairman of the section, presided over the two sessions held on Wednesday, June 21. Paleozoic stratigraphy and sedimentation furnished the theme of the morning meeting, and several of the papers dealt with new methods of attacking old problems in stratigraphic research and in sedimentary petrology. In the afternoon, the Section on Anthropology (H) met briefly with Section E to hear the paper by Kirk Bryan and Louis L. Ray on "Quaternary Chronology and the Antiquity of the Folsom Culture." W. C. McKern occupied the chair, while Dr. Bryan presented the geologic facts of correlation which have led him and Dr. Ray to date the Folsom Culture provisionally as 25,000 years old. Geomorphic and geographic papers filled in the balance of an interesting and varied afternoon, in which members of the Association of American Geographers officially participated.

As a sequel to the stratigraphic session on Wednesday morning, members of Section E were provided on Thursday with an opportunity to study the Silurian and Devonian formations of the Milwaukee region. Under the expert guidance of Ira Edwards, the field party discovered that the thick mantle of glacial drift has not buried all the rocks which form the foundation of southeastern Wisconsin.

On Friday the Section on Engineering (M) and the American Society of Agricultural Engineers joined with the geologists and geographers in a symposium on "Soil Conservation and Land Utilization in the Great Lakes Region." E. F. Bean, state geologist of Wisconsin, and L. R. Schoenmann, of Michigan State College, presided, respectively, over the morning and afternoon sessions, in which problems of soil conservation were analyzed from the point of view of the engineer, the geologist, the forester, the agronomist and the agriculturist. The fourteen speakers were drawn from federal, state and educational institutions in Ohio, Indiana, Michigan, Wisconsin, Minnesota and the Prairie Provinces of Canada; hence the problems were viewed from all geographic angles, as well as from all professional standpoints. The size of the audience was not commensurate with the significance of the symposium, but those present participated actively in discussions which prolonged the meeting considerably beyond the scheduled hour for adjournment.

Because of small registration and the geological interests of those registered, the post-convention field excursion under the leadership of E. F. Bean was considerably modified. The proposed itinerary was shortened to include the drift margin between Madison and Baraboo, the Cambrian and pre-Cambrian geology of the Baraboo Range and the erosional features of the Wisconsin Dells. The party disbanded on June 25 with genuine regret that the full field program had not been followed.

In developing the Section E program, the secretary was materially aided by John R. Ball, F. T. Thwaites, E. A. Norton, Louis A. Wolfanger, F. M. Feiker, E. F. Bean, Ira Edwards and others. In view of the quality of the papers, the attendance was somewhat disappointing, for only 90 persons were present at one or more meetings, and the attendance at individual sessions did not exceed forty.

SECTION ON ZOOLOGICAL SCIENCES (F)

(From report by George A. Baitsell)

The program of the Section on Zoological Sciences (F) at the Milwaukee meeting was limited to two important symposia. One symposium, on "The Relation of Genetics to Geographical Distribution and Speciation," was under the chairmanship of L. J. Cole, of the University of Wisconsin, and the other one, "Regeneration," was under the chairmanship of J. W. Buchanan, of Northwestern University. Both of these symposia were of such interest as to attract unusually large audiences, the total attendance for the two days being somewhat over 100. It is expected that the papers presented in the two symposia will be published at an early date.

The papers presented were as follows:

Genetics Symposium:

1. Speciation in fishes. C. L. Hubbs, University of Michigan.
2. Some factors in the geographical distribution and speciation of Peromyscus. L. R. Dice, University of Michigan.
3. The geographical distribution of gall wasps. A. C. Kinsey, Indiana University.
4. Inter-racial crossing and mutation. A. H. Sturtevant, California Institute of Technology.
5. Speciation from the point of view of genetics. M. R. Irwin and R. W. Cumley, University of Michigan.

Regeneration Symposium:

1. The histological basis of regeneration and re-association in lower invertebrates. W. C. Curtis, University of Missouri.
2. The environmental control of regeneration in Euplanaria. Olin Rulon, Wayne University.
3. Regeneration in protozoa; a study of morphogenesis. William Balamuth, University of California.
4. Aspects of regeneration in Annelids. L. H. Hyman, American Museum of Natural History.

At the close of this symposium, Dr. Curtis presented a tribute to the late Dr. H. V. Wilson, of the University of North Carolina, in which he emphasized the outstanding quality of Dr. Wilson's personal character and scientific research.

SECTION ON BOTANICAL SCIENCES (G) AND AMERICAN SOCIETY OF PLANT PHYSIOLOGISTS

(From report by W. E. Tottingham, W. J. Hamilton, Jr., and Berch Henry)

The American Society of Plant Physiologists (F. P. Cullinan, *secretary*) cooperated with Section G of the association in conducting a symposium on "Photoperiodism," on Tuesday forenoon. A. E. Murneek, past president of the society, presided, and 50 persons attended. W. F. Loehwing presented an introductory statement of the current status of this concept, emphasizing the need of modification in ideas concerning "flowering" and its associated physiology. The significance of the appearance of flower primordia and differentiation of sexual parts was stressed. Differences of photoperiodic requirement for the inception of these developmental phases were noted and the inadequacy of the hormone concept to account for sexual differentiation was pointed out. Karl C. Hamner discussed the photoperiodic responses of several species in relation to the theory of hormone function in the flowering of plants. He presented evidence that, according to species, flower development may be initiated in either light or darkness or in combination of the two. Melcher's concept of the functioning of at least two hormones in the responses of Hyoscyamus was considered possibly applicable to the species here concerned.

R. H. Roberts reported that anatomical studies offer evidence for structural characteristics which follow blossom induction. He suggested that these may account for continuance of effects from short-term photoperiodic treatment. Inducing of blossoming by cooling a portion of the stem was interpreted as indicating that this organ may participate with the leaves in causing flowering.

A brief program of general papers was presented in the afternoon with W. F. Loehwing, president of the society, presiding. There was an attendance of 35. R. B. Harvey described procedure for determining ethylene in stored apples and pointed out the relation of this compound and associated products to the climacteric or tissue-breakdown phase of metabolism.

R. H. Landon described the preservation of strawberries and raspberries by addition of 20 to 30 per cent. carbon dioxide to the atmosphere of the storage room. In general the firmness and flavor of the fruit were retained to remarkable degrees.

Orville Wyss (sponsored by P. W. Wilson) presented a paper on the exudation of nitrogenous compounds from the root nodules of leguminosae. Illustration of the development of associated non-leguminous plants and findings from the determination of nitrogen in the tissue were shown as evidence.

On Wednesday the society convened with the Botanical Society of America, the American Phytopathological Society, the American Society of Plant Taxonomists and the Mycological Society of America at the University of Wisconsin in Madison. In the forenoon these groups were welcomed by President C. A. Dykstra and Dean E. B. Fred, with E. M. Gilbert presiding. Informal responses were made by representatives of the bodies concerned. In the afternoon an invitation program arranged by the Society of Plant Physiologists consisted of addresses by G. F. Thornton on "The Rôle of the More Abundant Mineral Elements," and by B. M. Duggar on "Aspects of Radiation as Applied to Some Physiological Problems." Forty persons were in attendance. The remainder of the afternoon was devoted to inspection of equipment in the research laboratories of the division of plant physiology of the university. At an informal dinner arranged by the Phytopathological Society colored and motion pictures of fungi and flora of Wisconsin were shown by a representative of the Wisconsin Conservation Commission. On Thursday afternoon the following program was presented before a largely attended joint session of the several societies, with I. E. Malhus presiding.

1. Physiological differentiation of sex in dioecious angiosperms. J. Fisher Stanfield, Chicago Teachers College, Chicago, Ill.
2. New species of plant microfossils from the Des Moines Series of Iowa. L. R. Wilson, Coe College, Cedar Rapids, Iowa.
3. Genetics of pollen tube growth in Datura. J. T. Buchholz, University of Illinois, Urbana, Ill.
4. Phylogeny of the Gramineae. Paul Weatherwax, University of Indiana, Bloomington, Indiana.

The remainder of activities through Friday consisted of field trips, inspection of laboratories and social gatherings. Effective arrangements for the entertainment of visitors had been arranged by a committee, of which N. C. Fassett was chairman. Abundant non-technical interests were provided for the ladies, a tea on Wednesday afternoon and picnic of all attendants of the several groups on Thursday being high spots among the events.

The Ecological Society of America (W. J. Hamilton, Jr., secretary) held its summer meetings in conjunction with the A. A. A. S. at Milwaukee, June 19 to 24, at which eight papers were presented. On Tuesday morning the society had one session, C. F. Korstian presiding, at which papers were presented by Edward Haskell, Eldon J. Strandine and Theodore M. Sperry. During the afternoon, members of the society met with the Section on Social and Economic Sciences in a symposium on "Population Problems and Planning in the Northern Lake States."

On Wednesday morning a symposium on "Socio-economic Approach to Land Use" was well attended

Aldo Leopold presented a paper on "The Relation of Game Management to Land Use." The second paper was by K. C. McMurry on "Geography and Land Use." The third paper was given by George S. Wehrwein on "The Economist's Approach to the Problem of Ecology," while the final paper was presented by Raphael Zon on "The Broader Social Implications of Land Use in the Cutover Region." Discussion of the papers was led by L. R. Schoenmann, presiding officer.

The Thursday morning session, held jointly with the Section on Social and Economic Sciences (K), dealt with the status of population mobility and on the application of culture area concept and research studies.

A three-day joint field trip with the Society of American Foresters was participated in by about 100 persons. The field trip, covering a distance of approximately 600 miles, gave the ecologists and foresters opportunity to see forest plantings, commercial selective logging, some Forest Service salvage logging of cutover areas, a Forest Service nursery and the virgin timber and selectively logged area on the Menomonie Indian Reservation, which is one of the finest remaining hardwoods in the Lake States.

SECTION ON ANTHROPOLOGY (H)

(From report by Wilton Marion Krogman)

At the Milwaukee meeting 17 papers were presented before the section, the attendance being about 15 persons. The major portion of the program centered about the theme of the pre-history of man in North America and subsequent acculturation. Earl Count stated that the earliest physical type of the American Indian was not basically Mongoloid, but contained elements more closely related to the present-day peoples of Australia-Melanesia. A series of papers was devoted to the analysis of presumed early material from Lake Pelican, in Minnesota. T. E. Evans reported on jaws, F. J. Borelli on teeth, P. B. Candela on blood-grouping, J. E. Hill on associated mammalian remains and Mrs. Gertrude S. Evans on associated artifacts. Certain "primitive" characters of jaws and teeth were pointed out; the blood-group was ascertained to be *A;* the mammalian remains were found to be identical with living forms of muskrat and pocket-gopher; the artifacts were very doubtfully related to "Yuma-Folsom" types. In all, there was no reason to consider the material as of any great antiquity. A. E. Whiting discussed the origin of Indian corn, concluding that it might have arisen from any wild-growing form within the area where corn was found at the time of the discovery of America. H. C. Shetrone reported on representations of the human form found in Ohio prehistoric art, giving some idea of physical type and of costume. Mrs. Gretchen Cutter outlined the archeological sequence at a specific site from Will County, Illinois, as Middle Mississippi in earlier levels, Woodland in later. Miss Frances Densmore showed how the ceremonies of the modern Indians demonstrate acculturation, in that they blend traits of aboriginal religion with Christian doctrines. At the Wednesday afternoon session the section met jointly with the Section on Geology and Geography to hear the paper by Kirk Bryan and L. L. Ray on the glaciology of the Southern Rockies with special reference to the antiquity of the Folsom culture at the Lindenmeier, Colorado, Site. The age was given as the third Wisconsin substage (Corral Creek Moraine), 25,000 years old, according to the Antevs chronology. Henry Field presented the results of his extensive study of the modern peoples of Persia: basically long-headed Mediterraneans, with evidence that roundheads (Proto-Alpines and Armenoids) came in at an early historic date. The section is indebted to Dr. S. A. Barrett and his staff for cordial hospitality and the opportunity to inspect the fine displays in the Milwaukee Museum, in which the sessions were held.

SECTION ON PSYCHOLOGY (I)

(From report by Hulsey Cason, secretary pro tem)

The program of the Section on Psychology included two sessions of six papers each and two symposia. The sessions were of high quality, and the average attendance was about 30 persons.

Of special interest in the session on General Psychology was the strong paper by Dean Edward A. Fitzpatrick, of Marquette University, on "The Scholastic Self." This paper and the animated discussion which followed brought out in clear relief the shortcomings of our modern system of educational regimentation, the principal failing of the schools being in the direction of the psychological influences on the students themselves. The general conclusion reached by Laird T. Hites and Howard Becker on the family and marriage courses in universities was that these courses should include materials from various academic fields and that they should not be given from the limited point of view of a single university department.

A very profitable symposium on "Measuring Attitudes" was conducted by Stephen M. Corey. The discussion by Mr. Corey and H. H. Remmers brought out the need for a clearer concept of attitudes and for additional clarity in the use of statistical measures.

Of special interest and scientific value was the symposium on "Neuromuscular Tension," the speakers being Edmund Jacobson, Earl Fowler and Maurice H. Krout, of Chicago, and Walter B. Cannon, of the Harvard Medical School. Dr. Jacobson and the other participants in the symposium presented much evidence showing the intimate interrelation of various organic functions and the practical medical value of the method of progressive relaxation.

SECTION ON SOCIAL AND ECONOMIC SCIENCES (H)

(From report by E. P. Hutchinson)

The Milwaukee program of the section contained two separate sessions on economics, a luncheon meeting with Pi Gamma Mu and two symposia. Of these two latter, one dealt with "Population Problems and Programs in the Northern Lake States"; the other, the third in the Science and Society series, with "The Economic System in Relation to Scientific Progress."

The population symposium, held under the auspices of the Population Association of America, was designed to give an understanding of the nature and origin of the existing problems and to review the measures undertaken to meet them. A total of 20 papers, divided into seven sessions, were contained in the symposium. In the introductory session of Tuesday morning Glenn T. Trewartha traced the history of the settlement of Wisconsin, outlining the transition from exploitation to occupation of the area and the attendant changes in the pattern of population distribution. W. B. Dick identified the principal places of origin of the earliest settlers as the Genesee Valley, New York, and certain portions of the adjacent states, and traced the favored routes of in-migration. Using census data for the period 1850 on, Guy-Harold Smith demonstrated the growth and changing distribution of population in Wisconsin, emphasizing the clustering movement which succeeded the early occupation, and predicted a continuation of this trend.

Following this historical introduction, E. M. Davis interpreted the changes of population and its distribution in terms of the changing economy of the area, indicating the demographic concomitants of the rise and fall of the lumbering industry, of the coming of railroads, etc. Stanley D. Dodge indicated the dependence of the population capacity of an area on the prevailing form of land use or economy and means of estimating this capacity. Raphael Zon emphasized the undesirability of a lively exploitive economy in the northern cutover area, and the desirability of local utilization of revenues.

Following an outline of population trends in Wisconsin by Samuel Teper, George Wehrwein discussed the work of the Wisconsin State Planning Board, emphasizing the importance of rural zoning as a direct means of regulating population distribution and the necessity of such a means of preventing universal settlement. M. W. Torkelson presented the recommendations of the Regional Committee for the economic rehabilitation of the cutover area, these being for reforestation and for the relocation of the inhabitants into comfortable and efficient settlements.

The third of the projected series of conferences on "Science and Society" was on "The Economic System in Relation to Scientific Progress." It consisted of four general sessions, at the first of which George W. Edwards delivered an address on "The Capitalistic System and How it Evolved," followed by Rufus S. Tucker, who spoke on "Free Enterprise and Scientific Development." At the second session Charles F. Roos presented a paper on "The Application of Natural Science Methodology to Economic Studies," and H. G. Moulton delivered an address on "Economics and its Dynamic Aspects." The speakers at the third session were Leverett S. Lyon, on "The Role of Government in the Economic System," and James W. Bell, on "Government Finance and Economic Stability." The final session consisted of a paper by Charles H. Judd, on "Present Relations of Government to Science," and another by William F. Ogburn, on "Should the Government Finance Non-governmental Research Activities?"

SECTION ON MEDICAL SCIENCES (N) AND SUBSECTION ON PHARMACY

(From reports by Malcolm H. Soule and Glenn L. Jenkins)

Of the 50 papers prepared for the Section on Medical Sciences (Malcolm H. Soule, reporting) 18 were devoted to various subjects of general interest, ranging from such topics as the cause of cancer to the use of helium in encephalography, and 32 were contributions to a Symposium on "The Gonococcus and Gonococcal Infection." The first session, held on Monday afternoon, was introduced with a group of three reports on the problems of lead and arsenic in the body. Humanity living in a big city is always exposed to small quantities of lead from gasoline fumes discharged by automobiles; hence information as to its possible action is desirable. In one study the blood and urine of 165 lead workers were examined for the effects on the blood picture and the presence of the heavy metal, two thirds of these individuals having had continued exposure to inhalation of lead dust in the storage battery industry for periods of from 5 to 20 years. In the findings distinction was drawn between lead absorption and lead intoxication, the former being a warning of possible future lead intoxication; the latter condition, while an agonizing experience, being easily relieved by intravenous calcium treatment.

One of the benefits of microbic life to mankind was brought out in a paper dealing with the coagulation of the blood. Since newborn infants have no prothrombin in their systems, they are unusually susceptible to death from hemorrhage. Prothrombin is formed from vitamin K. Bacteria introduced into the body shortly after birth, in the ordinary course of exposure, synthesize vitamin K, which in turn is converted into prothrombin, and in this manner nature provides a real barrier against post-natal bleeding.

The activities of the Milwaukee Convalescent Serum Center, which is one of the outstanding units of its kind in the country, were described. During the past five years human convalescent scarlet fever serum has been prepared and used in the prophylaxis and treatment of scarlet fever. In a few instances this material has been employed in other infections caused by hemolytic streptococci. Patients with erysipelas have responded favorably in every instance following the administration of the serum.

The symposium, "The Gonococcus and Gonococcal Infection," was jointly sponsored by the American Neisserian Medical Society and Section N. Four sessions, which ran consecutively, were held on Tuesday afternoon, Wednesday morning and afternoon and Thursday morning, the average attendance being 60.

The program on Tuesday focused attention on the biology of the gonococcus. This micro-organism was discovered in pus from infected individuals just 60 years ago, and its causal relationship to one of the most wide-spread maladies of man was accepted, although it was some time before the germ was cultured on artificial media. During the intervening years the delicate nature and the fastidious requirements of the organism have been repeatedly confirmed, but little has been added to our knowledge of the mechanism by which the associated disease is produced. The discussion favored a belief in the synthesis of toxins, but the nature of these metabolites is enigmatical. Possibly the crux of the problem is that the technique of toxin production under artificial conditions is fraught with many difficulties, and all procedures with this end in view must be carefully standardized in order to obtain data that are in essential agreement. Research with this organism is complicated by the lack of a suitable susceptible laboratory animal. To date no investigator has produced, except in humans, an infection which simulates in a satisfactory degree the ordinary disease as it occurs in man. Such experiments are naturally limited and difficult to control. The existence of natural immunity in certain individuals is recognized, but the attempts at stimulating artificial immunity by the introduction of any of the biologicals available at present has been uniformly disappointing.

On Wednesday morning 9 papers were contributed to the problem of diagnosing gonococcal infection and the criteria for its cure. The disease in males lends itself to rather easy diagnosis, but in females the problem is complicated. The examination of stained smears of specimens from suspicious areas is of considerable aid, but cultural studies are recognized as essential for the diagnosis in doubtful instances and as a criteria for cure. Such procedures must be carried out at repeated intervals by well-trained workers. Three papers on gonococcal arthritis, meningitis and proctitis completed the morning program.

Sulfanilamide and related compounds received, as was to be expected, considerable attention in the symposium. It was agreed that in some types of gonococcal infection, such as ophthalmia neonatorum, the use of this drug is followed by almost miraculous cures. In other manifestations the results are good but not as striking. In a limited number of patients the use of the chemicals seems to delay therapeutic progress, possibly the strain of germ involved having become drug-fast. Encouraging reports were given following the administration of sulfapyridine, this compound having certain advantages over sulfanilamide. The mechanism by which any of these drugs exerts its beneficial action was discussed at great length, but the available data permitted of no conclusions. The final paper on the symposium was devoted to the administrative problems in the control of gonococcal infection.

The symposium, the most comprehensive ever held on this subject, was an outstanding success. The discussions afforded an opportunity for an interchange of experiences in using the present laboratory aids for diagnosis and served the very practical purpose of stimulating a most critical attitude in evaluating the reports of the results of treatment with the newer chemical compounds.

Two sessions of the Subsection on Pharmacy (Glenn L. Jenkins reporting) were devoted to a symposium on the vitamins with particular reference to their standardization.

Aaron Arnold, in his report on thiamin, pointed out that interfering substances limit the value of the chemical methods of determination and that the biological method based on growth is the most reliable procedure. Simpler and more rapid methods for the determination of thiamin and new criteria of its functions will make it possible to determine whether the level for optimum nutrition is appreciably above the requirement level. P. H. Phillips, in comparing the methods for the assay of riboflavin based on fluorescence, color and photolysis, and growth promotion, pointed out that the bio-assay method is the most accurate method now known, but that the colorimetric method offers much promise when applied to the degradation products of this vitamin. Methods using micro-organisms are economical, rapid and accurate for the determination of trace levels. Evidence has been obtained which indicates that riboflavin may be necessary for the deaminization of amino acids and the formation of urea in the liver. It plays an important rôle in nerve nutrition in chicks which exhibit neuromalacia on low riboflavin diets and recover rapidly when the deficiency is supplied by the administration of riboflavin. C. A. Elvehjem reviewed the procedures which led to the isolation of nicotinic acid fraction of the Vitamin B complex. He showed that while chemical procedures, bacterial growth methods and bio-assays offer possibil-

ities, the most reliable assay procedure at present is the curative method applied to dogs in which black tongue has been induced by feeding a suitable nicotinic acid deficient basal ration. It was emphasized that a chemical method of assay is greatly needed so that our knowledge of the distribution of nicotinic acid, as well as other factors in foods, may be made known. When this knowledge is available it will be possible to modify the diet, particularly in areas where pellagra is prevalent, and fortify the diet with nicotinic acid if necessary to prevent the disease. W. D. Woolley discussed the chick antidermatitis factor and pantothenic acid of the vitamin B complex. The assay of the former is best carried out on chicks by noting the growth and prevention of dermatitis as compared to chicks on a basal diet. A method for the determination of pantothenic acid which is rapid, economical and accurate has been devised. It is based on the discovery that pantothenic acid is essential for the growth of a wide variety of hemolytic streptococci. An assay by this method can be completed in 24 hours and it excels the animal method in precision. All the authors of papers pertaining to the *vitamin B complex* emphasized the need for chemical methods of assay and for methods of assay which would permit the determination of the concentration of vitamins in the blood.

A. Black critically examined the factors which influence the accuracy of vitamin A assays. He pointed out that the biological methods measure the combined vitamin A activity of the various compounds which may become available as vitamin A to the rat and that the method is not specific for any particular kind of vitamin A. Methods based on the measurement of the absorption of light by means of spectrophotometers have been widely used and are the most accurate and give the most information about the sample.

Vitamin E, the anti-sterility vitamin, was reviewed as to its sources, isolation, chemistry, physiological activity and assay by Mrs. Flemintine P. Dann. The production of pure alpha tocopherol (Vitamin E) offers promise of leading to a more quantitative method than the present bio-assay.

SECTION ON AGRICULTURE (O): SOCIETY OF AMERICAN FORESTERS

(From report by Henry E. Clepper)

The Society of American Foresters met in five sessions, one of which was a joint session with the Ecological Society of America. Twenty-two papers were presented covering research with chemicals in forest fire control, the utilization of forest products, forest recreation, reforestation, forest management, selective logging, land planning and land use, soil conservation, game management and a discussion of the social and economic problems of forestry in the Lake States.

The foresters' banquet was held at the Milwaukee Athletic Club.

Four days were devoted to field trips. Visits were made to the Forest Products Laboratory, Madison, Wis., to the Goodman Lumber Company operations, the Nicolet National Forest and the Menomonie Indian Reservation.

Approximately 100 members of the Society of American Foresters attended the sessions. In addition, about 20 non-members participated in the field trips.

SECTION ON EDUCATION (Q)

(From report by H. H. Remmers)

The Section on Education (Q) held three sessions at which 17 papers were scheduled. Owing to unforeseen circumstances two of the speakers were unable to appear. The attendance at the meetings ranged from 20 to 46, with an average slightly over 30 for the various sessions. The general theme of the three sessions was the education of the emotions.

In the first morning session Miss Margaret Joseph, of Shorewood High School, Milwaukee, presented an interesting study on "The Factor of Interest in the Teaching of Mathematics." Her data indicated that if pupils in the lower fourth of the distribution on scores of a group intelligence test and a reading test were not required to take high-school mathematics, there would be practically no failing students in mathematics. A paper on "Interests and Attitudes of Junior High School Pupils," by W. Clark Trow, of the University of Michigan, presented an interesting longitudinal study of which the implications for guidance were made strikingly clear. H. Meltzer, of the Psychological Service Center, St. Louis, Mo., presented an important paper on "Educational Implications of a Study of Race Attitudes of School Children." In general, the data showed less differentiation of children's attitudes toward races than do those of adults, and also a significant change over the period from 1934 to 1938 in the same population of school children, the change being in general one of a relatively less favorable attitude toward totalitarian countries and a more favorable attitude toward the democracies. Numerous factors were shown to condition the racial attitude, such as home, neighborhood, companions, etc. Human tragedies as the result of inadequate sex education were delineated by Robert S. Drews in a paper under the title "Evaluation of Adult Neuroses in the Light of Inadequate Sex Education." In the discussion the relative inadequacy of both educators and physicians in terms of the training programs for each were brought out. The final paper in the first morning session was by Roy C. Bryan, Western State Teachers College, Kalamazoo, Michigan, on "Evaluation of Student Reaction to Secondary School Teachers." Dr.

Bryan stressed the importance of the emotional factors in all learning and the way in which emotionalized attitudes toward the teacher may condition the learning and adjustment of the pupil.

The first paper of the afternoon session was on "The Use of Music in an Educational Program of Mental Hygiene," by Dr. O. Irving Jacobson, of Shurtleff College, Alton, Illinois. Dr. Jacobson's experiment concerned a galvanometric study of 16 subjects subjected to different types of music. While no conclusions could be drawn from the relatively limited data, a number of very interesting leads for further research appeared. The second paper, "Some Educational Implications of the American Youth Commission Study of Civilian Conservation Corps Camps," by Kenneth Holland, associate director of the American Youth Commission, Washington, D. C., presented a picture of the uniqueness of the educational problems in CCC Camps and the relative emotional and educational adjustment which the enrollees make. The third paper, by Stanford C. Ericksen, University of Arkansas, on "An Experimental Investigation of Student Motives: Why Do Students Want to Make Good Grades?" showed that motivation in learning in college varies with sex of the student, the curriculum, the class, membership in Greek letter fraternities, etc. That more realistic and wholesome attitudes toward problems of marriage are being developed was shown in an interesting paper by E. F. Van Buskirk, of Stephens College, under the title, "Interests and Attitudes of College Women in Regard to the Biological Basis of Marriage and Some of its Social Implications." The final paper in the afternoon session was presented by Miss Mildred B. Mitchell, of the Psychopathic Hospital of the State University of Iowa, under the title, "The Revised Stanford-Binet Test for Adults." The tests were shown to be considerably more discriminative than the 1917 edition.

The final morning session was introduced by a paper by J. H. Farley, of Lawrence College, under the title "Modern Higher Education, Comprehensive Reflective Thinking and the Factors of Emotion, Interests and Ideals." This paper was a critical examination of the outcomes of modern higher education in terms of student thinking and emotional adjustment. The second paper, by E. I. F. Williams, of Heidelberg College, on "Constructive Emotions as Resources in Teaching," summarized in excellent fashion some of the more significant experimental findings with reference to the education of the emotions and brought out important educational implications of these findings. "Adjustment *vs.* Mental and Physical Health in Freshman Medical Students," by Leo P. Clements, of Creighton University, considered the unhygienic nature of the medical curriculum when viewed in the light of serious emotional and physical maladjustment of students. A paper by F. C. Dana, of Iowa State College, on "Engineering Problems Courses as Aid to Discovering Interests and Aptitudes of Students," reviewed the experience at Iowa State College over a period of more than 20 years with such a course, and described the methods and means of detecting the characteristics of students in the interests of their educational-vocational guidance by means of this course. The final paper on "General Semantics and the Control of Affective Processes in Education" was presented jointly by Miss M. Kendig, of the Institute of General Semantics, in Chicago, and by C. B. Congdon, psychiatrist at the University of Chicago. A growing interest in the problems of semantics as related to emotional adjustment made this paper particularly timely.

OBITUARY

HARRY VICTOR ATKINSON
1887–1939

ON May 7, 1939, at Vermillion, S. D., death from a cerebral hemorrhage cut short the career of Professor Harry Victor Atkinson in his fifty-second year. He was born at Van Wert, Ohio, on February 12, 1887. Fundamentally trained in chemical engineering at Ohio State University (B.S., 1911), he continued in that field only three years. Supported by an instructorship in physiological chemistry at the Northwestern University School of Medicine (1914–17), he undertook the study of physiology and allied sciences at that institution and at Rush Medical College. From 1917 to 1920, he was instructor of physiology at Cornell Medical College, a position that was interrupted by nine months' service overseas in the Chemical Warfare Service. Working under an instructorship in pharmacology, he completed his work for the doctorate degree in pharmacology at the Medical School of the University of Illinois (1922).

His academic career reflects the esteem in which he was held by the members of his profession. He was, successively, associate professor of pharmacology, Texas, 1922–24; professor of pharmacology, Texas, 1924–26; associate professor of pharmacology, Iowa, 1926–28; and professor of physiology and pharmacology at the University of South Dakota from 1928 until his untimely death. Of his nineteen publications, he will be particularly remembered for his work on the conversion of protein to fat in the dog and his studies on the chemical changes in the blood during anesthesia. He held membership in the American Society for Pharmacology and Experimental Therapeutics, the Society for Experimental Biology and

Medicine, the American Association for the Advancement of Science, the South Dakota Academy of Science and Sigma Xi.

Professor Atkinson made many lasting friendships among his colleagues, and was a continual source of help and inspiration to his students, many of whom he helped obtain financial support for the continuation of their studies. Although his life was short, his fundamental contributions in pharmacology and physiology assure his work a permanent place in the literature of these sciences. His widow, Bertha Hartmann Atkinson, and two daughters survive him.

EDWIN H. SHAW, JR.

UNIVERSITY OF SOUTH DAKOTA

RECENT DEATHS AND MEMORIALS

DR. WARREN PLIMPTON LOMBARD, for thirty-one years professor of physiology at the School of Medicine of the University of Michigan, died on July 13 at the age of eighty-four years.

DR. FREDERICK P. GAY, since 1923 professor of bacteriology at the College of Physicians and Surgeons of Columbia University, died on July 14, aged sixty-five years.

DR. JOHN H. MCFADDEN, assistant professor of psychology at the University of Pittsburgh, died on May 28. He was in his forty-first year.

DR. DONALD CLINTON BARTON, since 1935 research and consulting geologist and geophysicist for the Humble Oil and Refining Company at Houston, Texas, died on July 8 at the age of fifty years. He was president of the American Association of Petroleum Geologists.

HAVELOCK ELLIS, author and sociologist, known for his researches in the psychology of sex, died on July 8 at the age of eighty years.

DR. E. KIDSON, since 1927 director of the Meteorological Services of New Zealand, has died at the age of fifty-seven years.

ACCORDING to the *Journal* of the American Medical Association a bronze plaque, the gift of an anonymous donor, has been presented to the St. Louis Medical Society in honor of the late Dr. Nathaniel Allison, at one time dean of the School of Medicine of Washington University. The bronze plaque is the work of Carl C. Mose.

Nature states that a portrait of James Watt was unveiled by Sir Nigel Gresley at the Institution of Mechanical Engineers during the course of a reception held on June 9. The portrait represents Watt at fifty-seven years of age; it was painted in 1792 by Charles Frederick von Breda, and was acquired by the institution from the family of John Rennie in 1936. During the reception, a formal announcement was made of the award of the James Watt International Medal to Henry Ford, and an address was delivered by the American Ambassador.

SCIENTIFIC EVENTS

THE ANNUAL FIELD DAY OF THE ROTHAMSTED EXPERIMENTAL STATION

ACCORDING to an article in *Nature* the annual field day and inspection of the laboratories was held at Rothamsted on June 28, with Lord Radnor, chairman of the Lawes Agricultural Trust Committee, presiding. There was a large attendance representing agriculture and the allied industries. Sir E. Kaye le Fleming, chairman of the Council of the British Medical Association, was the chief guest.

In his survey of the activities of the station, Sir John Russell mentioned that some work had already been carried out in the Dunn Nutritional Laboratories at Cambridge on certain aspects of the vitamin content of the produce of the Rothamsted plots. But so far there has been no confirmation of the view frequently expressed that the nutritive value of produce grown with organic manure is superior to that grown with artificial fertilizers. The produce of the classical fields should provide excellent material for settling points such as these.

An increasing amount of experimental work at Rothamsted is concerned with the action and value of organic manures. Studies are in progress with straw in its many forms, with turf obtained by the ploughing up of grassland, with green manures and with town refuse. An extensive investigation of poultry manure has been completed, and work on wastes and sewage sludge is in prospect. So far, yield determinations have been the chief measurements; but the much more difficult questions of quality and nutritional value can scarcely be ignored.

The tour of the farm, always an important part of the proceedings, affords an unrivalled combination of the oldest and the newest in field experimentation. Broadbalk, carrying an excellent crop of wheat this year, showed the striking effects of the manurial treatments begun by Lawes and Gilbert ninety-six years ago and continued ever since, the plots gaining rather than losing interest from the periodical bare fallows recently superimposed upon them. The field is studied now, not simply as a demonstration of manurial principles, but as a guide to the practical problems of corn growing under semi-continuous conditions.

Passing on to the modern experiments, the visitors inspected several of the new designs set out to measure fertilizer effects on a sequence of crops.

An indoor program followed. Investigations in the

laboratories link up with the farm work in many directions. Thus "take-all," one of the foot-rot diseases of cereals, is intensively studied in the Plant Pathology Department, where many of the conditions of the survival of the fungus in the soil have been worked out, and control methods are being beveloped. In the Entomological Department a technique for measuring the wire-worm population of the soil has been perfected and used to assess the value of the various soil insecticides tested in the plots. Various methods put forward for predicting the manurial requirements of soils on the basis of their chemical analyses are being examined in the Chemical Department. A wider range of soils than the Rothamsted Farm can provide is necessary for this work, and in recent years an increasing number of outside centers have been established, each providing the results of a precise and comprehensive fertilizer test and the corresponding sample of soil for laboratory examination.

The Rothamsted Centenary is due in 1943, and the committee proposes to celebrate it by putting the laboratories, farm buildings and other equipment into complete order for the work that awaits them. The director announced the present position of the Appeal Fund, and said that although good progress has been made in very difficult times, £7,000 is required to complete the first part of the scheme costing £60,000.

ENGLISH NEUROLOGIC RESEARCH INSTITUTE

THE opening of a new well-equipped building for investigation into the causes of mental defects and abnormalities and borderline conditions which has been opened at Bristol by the secretary of state for the Dominions in the presence of a distinguished company of neurologists is described in the *Journal* of the American Medical Association. It is called the Burden Neurological Research Institute because it has been made possible by the cooperation of Mrs. R. G. Burden, warden of Stoke Park Colony for Mental Deficients, within the grounds of which the new building has been erected. Professor Golla is to be the director, and the staff will consist of Grey Walter, electrophysiology; Dr. Max Reiss, a Czech endocrinologist; N. S. L. MacLeod and A. Tingey, biochemists, and Dr. Wylie McKissock, visiting surgeon.

Among those present was Dr. P. O'Brien, representative in Paris of the Rockefeller Foundation, which has made a generous contribution to the neurosurgical department. The Medical Research Council has also made a grant in support of some of the research work. The director, Professor Golla, said that only those who had realized how the multiplicity of competing claims hampered the work of the large hospital clinics would fully appreciate the advantages of such a research institute, which was equipped in the very best way for the investigation not only of the functions of the nervous system but of the body as a whole. In the preoccupation with the brain there was some tendency to forget the bodily stratum of mental disease. It was intended to take a few carefully selected cases and investigate them by every means available to electrophysiologic and endocrinologic research. An immediate occupation would be the study of the varied group of pathologic states of the brain which were responsible for epileptic seizures. What the neurologist called epilepsy was the least understood of the common nervous diseases. It was hardly an exaggeration to say that our knowledge had received little addition since the time of Galen until certain researches, carried out chiefly in America and England, had given hints for further investigation. There were now good grounds for hoping that certain electrophysical methods would enable us to understand and combat this distressing disease.

THE SOCIETY OF THE SIGMA XI

THE Case Chapter of the Society of the Sigma Xi held its annual initiation on the evening of June 2. Twenty-eight students were elected to full membership. Officers elected for the next year were Professor Francis Whitacre, *president;* Professor Robert Shankland, *vice-president;* Dean T. M. Focke, *treasurer,* and Professor Richard S. Burington, *secretary.* Following the ceremonies, at which Professor G. E. Barnes, retiring president, presided, Dr. Zay Jeffries, technical director of the Incandescent Lamp Department of the General Electric Company, spoke on "New Light Sources."

The Sigma Xi Club of Peking held its annual meeting on May 4. Dr. Eugene L. Opie, of Cornell University Medical College, was the guest speaker. He gave an address on "The Study of Tuberculosis." New officers were elected as follows: *President,* Professor K. P. Young, Peiping Research Institute; *Vice-president,* Dr. H.-C. Chang, Peiping Union Medical College; *Secretary-Treasurer,* Dr. Peter P. T. Sah, Fu Ren University. The printed membership list of the club gives the number of active resident members as twenty-nine with twenty-seven non-resident members.

A Sigma Xi Club of Hawaii has been formed, with a charter membership of fifty. The first officers are: *President,* Dr. C. J. Hamre; *Vice-president,* Dr. Martha Potgieter; *Secretary-treasurer,* Dr. S. S. Ballard; *Councillors,* Dr. H. E. Gregory and C. E. Pemberton. The first regular meeting of the club was held on June 7 at the University of Hawaii, when Dr. R. N. Perlstein, of Leahi Home, spoke on "Epidemiological Study of Tuberculosis Families in Hawaii."

THE CONVENTION OF THE ELECTROCHEMICAL SOCIETY

THE fall convention of the Electrochemical Society will be held in New York City on September 11, 12 and 13. New York was selected by the Board of Directors in order to combine attendance at the convention with a visit to the New York World's Fair. It is planned that these take the place of the usual plant inspections. There will be three technical sessions, to be held at the Hotel Commodore. The Monday morning session will be devoted to papers on electrothermics and electronics. On Tuesday morning will be the symposium on "Recent Progress in Electro Analysis," in charge of Professor Hiram S. Lukens, of the University of Pennsylvania. The Wednesday morning session will be in charge of Dr. Robert B. Mears, of the Aluminum Company of America, and will be devoted to "The Influence of Cathodic Reactions on Corrosion." There will be at least six contributions at each of the three sessions. A special session will be held at the Fair Grounds on Monday afternoon in the Hall of Science. Professor Bradley Stoughton, of Lehigh University, will deliver the sixth Joseph W. Richards Memorial address. His lecture will be entitled "Modern Marvels of Electrochemistry." It will be profusely illustrated and open to the public.

The principal social function will be the medal dinner on Tuesday evening, September 12, at which the Edward Goodrich Acheson Gold Medal and the $1,000 prize will be presented to Dr. Francis C. Frary, director of the Research Laboratory of the Aluminum Company. Past President William G. Harvey is the chairman of the committee of arrangements for this dinner.

Monday evening, September 11, has been reserved for an informal supper get-together and meeting at one of the popular restaurants on the Fair Grounds. The supper and entertainment will be sponsored by the local chemical companies.

In view of the large number of visitors in New York this September, members are urged to make their hotel reservations as early as possible. The headquarters of the convention will be the Hotel Commodore, 42d Street and Lexington Avenue, New York City.

THE BOSTON MEETING OF THE AMERICAN CHEMICAL SOCIETY

THE ninety-eighth meeting of the American Chemical Society will be held in Boston from September 11 to 15. Eighteen divisions will hold meetings, and papers and addresses reporting progress in every major sphere of chemical science will be presented at the sessions. Five thousand chemists, industrialists and representatives of allied fields are expected to participate.

Dr. James Bryant Conant, president of Harvard University and holder of the William H. Nichols Medal for achievement in chemical research of the New York section of the society, has been appointed honorary chairman of a convention committee of nearly a hundred members. Dr. Gustavus J. Esselen, president of Gustavus J. Esselen, Inc., and a director of the society, has been named general chairman.

Executives of leading industrial corporations and educational institutions will deliver addresses at a special celebration on Wednesday, September 13, of the centenary of the discovery of the vulcanization of rubber by Charles Goodyear, when numerous papers describing the progress of rubber research and manufacture in the United States will be read at a general meeting in the afternoon and at a dinner meeting in the evening.

The evening speakers and their topics are: W. S. Knudsen, president of General Motors Corporation, "What the Rubber Industry Has Meant to the Automobile Industry"; P. W. Litchfield, president of Goodyear Tire and Rubber Company, "The Rubber Industry"; Dr. Karl T. Compton, president of Massachusetts Institute of Technology, "Vulcanization from the Physicist's Standpoint"; Dr. Conant, "Vulcanization from the Chemist's Standpoint." Dr. Charles A. Kraus, of Brown University, president of the American Chemical Society, will preside and make a speech of welcome.

Speakers in the afternoon will be E. B. Babcock, chief chemist of the Firestone Tire and Rubber Company, "What is Vulcanization?"; A. B. Newhall, executive vice-president of the B. F. Goodrich Rubber Company, "Work of Thomas Hancock"; R. W. Lunn, managing director of the Leland and Birmingham Rubber Company, "Work of Charles Goodyear"; W. A. Gibbons, director of research of the United States Rubber Company, "The Rubber Industry Since 1839."

A Symposium on Vulcanization will be held on Thursday, September 14, under the auspices of the Division of Rubber Chemistry, the chairman of which is George K. Hinshaw, of the Goodyear Tire and Rubber Company.

Thirteen other divisional symposia are planned. The Chemical Education Division will discuss "The Training and Opportunities for Women in Chemistry." "Vitamins and Nutrition" will be discussed by the Divisions of Agricultural and Food, Medicinal and Biological Chemistry. Fields to be dealt with in other symposia include plant hormones, nitrogen-free extracts, methods in protein chemistry, sterols and related compounds, x-ray studies of substances of high molecular weight, the combustion of solid fuels, industrial wastes, unit processes, resins and plastics from hydrocarbons, low-temperature research and compounds with elements in unusual states of valence.

Dr. Kraus will deliver the annual presidential ad-

dress before a joint session of the Divisions of Organic and Physical and Inorganic Chemistry, on Thursday, September 14, at 2 P.M. Professor Frederick G. Keyes, of the Massachusetts Institute of Technology, will give an experimental lecture on "Properties of Matter at Very Low Temperatures" on Thursday afternoon during "open house" by the institute to members of the society.

Technical sessions will be held by the Divisions of Cellulose, Agricultural and Food, Colloid, Biological, Fertilizer, Gas and Fuel, Industrial and Engineering, Inorganic, Rubber, and Water Sewage, and Sanitation Chemistry, and of Microchemistry, Chemical Education, History of Chemistry and Sugar Chemistry and Technology.

Professor Ernest H. Huntress, of the Massachusetts Institute of Technology, who is chairman of the Northeastern Section of the society, is vice-chairman of the general convention committee. Professor Arthur R. Davis, of the institute, is secretary, and Frederick S. Bacon, of Boston, is treasurer. Chairmen of subcommittees are announced as follows: R. R. Stevens, accommodations; Kenneth E. Bell, entertainment; Grinnell Jones, ladies' entertainment; A. A. Vernon, student chemists; W. F. Twombly, publicity; J. M. Bierer, finance; E. O. Holmes, equipment for technical sessions; A. A. Ashdown, publications; H. J. Skinner, group meetings; L. F. Hamilton, registration; W. L. Jennings, reception; Mrs. F. C. Sargent, women chemists; L. A. Pratt, C. V. Briggs and J. J. Healy, Jr., trips; H. O. Kulberg, signs; H. L. Sherman, parking arrangements.

SCIENTIFIC NOTES AND NEWS

DR. LAWRENCE J. HENDERSON, Lawrence professor of chemistry at Harvard University, has accepted an invitation by the Royal Society to deliver the next Pilgrim Trust Lecture in London.

A CERTIFICATE of honorary membership in the American Society of the History of Medicine was presented at the recent annual dinner of the society to Dr. Rudolph Matas, professor emeritus of general and clinical surgery at Tulane University, in recognition of his work in having "preserved and passed on to generations of students the best traditions of medical humanism."

A DINNER in honor of Dr. Victor J. Chambers, of the University of Rochester, who is retiring from teaching, but will continue as dean of the Graduate School, was given on June 15 by his students and friends, two hundred of whom were present. A fund of $2,000, to be known as the Chambers Memorial Fund, was presented to the university to be used for loans to students of chemistry. Professor Chambers was presented with a suitably engraved gold watch.

COLLEAGUES of Dr. Isaac H. Manning, of the University of North Carolina, who is retiring with the title of Kenan professor emeritus of physiology, recently gave a dinner in his honor at which he was presented with a silver pitcher. A second testimonial dinner was given by alumni of the school. Dr. Manning has been for thirty-eight years a member of the faculty of the university, for twenty-eight years as dean of the School of Medicine.

AT a meeting of the Mexican Society of Natural History held in Mexico City on June 16, Dr. Robert Hegner, professor of protozoology in the Johns Hopkins University, was made an honorary member, and Dr. Redginal Hewitt, instructor in protozoology in the Johns Hopkins University, a corresponding member. On this occasion, Dr. Hegner delivered an address on "The Natural History of Parasitic Protozoa."

DR. ALEXANDER WETMORE, assistant secretary of the Smithsonian Institution, has been made an honorary member of the "Magyar Kiralyi Madartani Intezet."

AT the recent commencement exercises at Franklin and Marshall College the degree of doctor of science was conferred on Dr. Mitchel Carroll, professor of biology and head of the department, and on Dr. H. Justin Roddy, professor of geology and executive curator of the museum.

THE doctorate of science has been conferred by the University of London on Professor Niels Bohr, of Copenhagen, and on Sir Robert Robinson, Waynflete professor of chemistry at the University of Oxford.

AT a congregation of the University of Birmingham on July 1 the doctorate of science was conferred on Dr. Edward Battersby Bailey, director of the Geological Survey of Great Britain and of the Museum of Practical Geology, London; on Dr. Niels Bohr, professor of physics at the University of Copenhagen, and on Sir William Bragg, director of the Royal Institution and president of the Royal Society.

THE honorary degree of doctor of music recently conferred by the Chicago Musical College on Dr. Carl E. Seashore, of the State University of Iowa, was reported incorrectly in SCIENCE as having been conferred by the University of Chicago.

THE French League against Cancer has awarded the Amerongen prize of 160,000 francs to Professor A. H. Roffo, director of the Institute of Experimental Medicine for the Study and Treatment of Cancer at the University of Buenos Aires.

THE Royal College of Surgeons, England, has awarded the John Tomes prize for the years 1936–38 to Dr. Arthur Bullerd, for his researches into the bacteriology of the mouth. Professor Ernst W. Hey Groves has been appointed Moynihan lecturer for the current year.

AT the Milwaukee meeting of the American Neisserian Medical Society, which met in conjunction with the American Association for the Advancement of Science, the Francis Amory research award for 1940 was given to Dr. P. S. Pelouze, assistant professor of urology at the University of Pennsylvania School of Medicine.

THE American Radium Society awarded at the recent St. Louis meeting its Janeway Medal for 1939 to Dr. Gioacchino Failla, physicist to the Memorial Hospital for the Treatment of Cancer and Allied Diseases, New York City.

WITH the close of the academic year, Dr. Laetitia M. Snow, Susan M. Hallowell professor of botany at Wellesley College, retired from active service with the title emeritus. At the annual meeting of the Alumnae Association of the college she was elected to honorary membership. She will make her home in Pacific Grove, Calif., where she will continue her research at the Hopkins Marine Station of Stanford University.

PROFESSOR REGINALD PATRICK LINSTEAD, of the University of Sheffield, England, has been appointed professor of chemistry at Harvard University and a member of the University Committee on Pharmacotherapy. Professor Linstead has been at Sheffield for the past year, and for more than ten years previously was at the Imperial College of Science, London.

DR. THOMAS B. TURNER, of the International Health Division of the Rockefeller Foundation, has been appointed professor of bacteriology at the Johns Hopkins University School of Hygiene and Public Health.

Dr. C. E. NEEDHAM, associate professor of geology and mineralogy of the New Mexico School of Mines, has been elected president of the school. Other appointments are: Dr. M. L. Thompson, to be assistant professor of geology and paleontology, and Dr. N. P. Peterson, to be assistant professor of mining and metallurgy. Dr. Needham is also director of the New Mexico Bureau of Mines and Mineral Resources, and Drs. Thompson and Peterson are geologists on the staff of the bureau.

GORDON M. CAIRNS, of Ithaca, N. Y., has been made head of the department of animal industry in the College of Agriculture of the University of Maine. He succeeds Professor L. S. Corbett, who has been head of the department for the past twenty-six years. Professor Corbett retains his work as dean of men.

DR. DAVID F. SMITH, professor of chemistry at the University of Buffalo, has been placed at the head of the work on agricultural motor fuels at the Northern Regional Research Laboratory. He will undertake research intended to develop methods of producing gaseous, liquid and solid motor fuels from agricultural materials.

DR. ALBERT B. SCOTT, formerly of the Research Department of Parke, Davis and Company and for the past two years associated with The General Chemical Company, in New York City, has become connected with The Norwich Pharmacal Company. He is in charge of organic research in the new laboratories of the company at Norwich, N. Y.

DR. ELBERT C. COLE, professor of biology at Williams College, has been elected an alumni trustee of Middlebury College for a term of five years beginning on July 1.

THE Committee on Scientific Research of the American Medical Association has made grants to Dr. Felix Saunders, of the University of Chicago, for the continuation of studies on growth factors for bacteria; to Drs. Hugh J. Morgan and George P. Vryonis, of the School of Medicine of Vanderbilt University, for the study of bacterial infections in the chick embryo; to Dr. William C. Langston and Dr. Paul L. Day, of the School of Medicine of the University of Arkansas, to be used in their experiments on nutritional cytopenia in the monkey, and to Dr. Marion Fay, professor of physiological chemistry at the Woman's Medical College of Pennsylvania, for a continuation of experiments on the physiological effects of strontium.

DURING the summer Dr. John T. Stark, chairman of the department of geology of Northwestern University, is studying the volcanoes of the South Seas, with headquarters in Tahiti; Dr. John R. Ball, professor of geology, is making a study of the geology of the Tennessee Valley, which soon will be flooded by the Tennessee Valley Authority. Dr. William E. Powers, assistant professor of geology, is spending some time in Hawaii studying evidences of glaciation in the Hawaiian mountains. Dr. Arthur L. Howland has been commissioned by the U. S. Geological Survey to search for strategic mineral deposits in the Northern Rockies. A similar expedition will occupy Dr. C. H. Behre, Jr., after the summer term closes. Dr. Edward C. Dapples will be in central Illinois searching for oil deposits.

DRS. PAUL H. HARMON, director of the Division of Handicapped Crippled Children of Illinois; Thomas D. Masters, internist in diseases of metabolism in the Springfield clinic, and F. J. Phillips, assistant in chest surgery of the University of Chicago Clinics,

gave a series of lectures and held clinics in their respective specialties before the Tampico Medical Syndicate of Tampico, Mexico, from June 14 to 18.

THE thirteenth International Congress of Zoology, which was to have been held this year in Rio de Janeiro, has been postponed. It will be held at Paris in July or August, 1940. The address of the general secretary is 55 Rue de Buffon, Paris (V°).

THE twelfth International Congress of Psychology will be held in Edinburgh from July 22 to 27, 1940. When the Committee of Organization is fully constituted formal invitations will be issued. Subjects for symposia, general discussion and lectures are under consideration by a preliminary arrangements committee. A volume of proceedings, containing abstracts of papers read, will be published, the cost of which is included in the congress fee for active members, which has been fixed at thirty shillings; the fee for associates is fifteen shillings. Arrangements are being made by which a large proportion of the members can be accommodated in university hostels.

THE sixteenth National Colloid Symposium met at Stanford University from July 6 to 8. The registration was one hundred and sixty, five foreign countries being represented. The papers will be published in the autumn in *The Journal of Physical Chemistry.*

THE Committee on Research Grants of the Illinois State Academy of Science announces that requests for small grants to aid research will be received up to February 1, 1940. Requests should be accompanied by detailed statements of preceding background, general purpose and estimated expenses, and supported by three letters of recommendation sent directly by the writers. Individual grants can probably not exceed $75 per project. It is the custom to make grants only to those connected with smaller institutions within the state. Correspondence should be directed to C. H. Behre, Jr., department of geology and geography, Northwestern University, Evanston, chairman of the committee.

THE University of Minnesota Expedition to Richmond Gulf (Province of Quebec, Canada) left Senneterre, P. Q., on June 25 on the first leg of its flight to Richmond Gulf on the east coast of Hudson Bay. The objectives of the expedition are primarily botanical. The great variety of habitats, both from the physiographical point of view and the variety of soils associated with differing geological formations, make the region a promising one for a study of local factors affecting the distribution of plants in a region apparently glaciated recently. Associated problems, such as geochronology and tree ring chronology, will also be studied. The region being in a zone transitional to the barren grounds makes tree-line studies also possible. The personnel consists of Ernst C. Abbe, assistant professor in the department of botany of the University of Minnesota, organizer of the expedition; Mrs. Lucy B. Abbe and John Marr, assistant in the department of botany. The expedition is supported by grants in aid of research from the Graduate School of the University of Minnesota, the Bache Fund of the National Academy of Sciences, the American Academy of Arts and Sciences, the American Philosophical Society (Penrose Fund), the Smithsonian Institution and the Minnesota Academy of Sciences.

Museum News reports that the administration of the Blaskley Botanic Garden has been separated from the Santa Barbara Museum of Natural History and that the garden is now being conducted independently under the name of Santa Barbara Botanic Garden. Title to the property, however, remains in the name of the museum. The endowment provided by Mrs. William H. Bliss in memory of her father, Henry Blaskley, and heretofore adequate for the garden's maintenance, is no longer sufficient because of the decline in income from investments. In order to carry it on a group of those interested has formed the Santa Barbara Botanic Garden, Incorporated, and is appealing for contributions. Officers of the new corporation are William Lassiter, *president;* Mrs. Anne Stow-Fithian, *vice-president;* Frederick B. Kellam, *secretary;* and Frank J. McCoy, *treasurer.* Elmer J. Bissell, formerly director of the garden, is honorary president. Maunsell Van Rensselaer continues as director of the garden.

DISCUSSION

CENTERS OF POPULATION OF LEARNED GROUPS

A FEW years ago one of the learned societies announced that in response to requests for an annual meeting held in the Far West, the next meeting would be in Richmond, Va. To the members residing many miles west of the Mississippi River, this statement seemed ludicrous. However, some one raised the question: With respect to the membership of the organization, could it be possible that Richmond is *far west*?

The study reported is an attempt to determine the center of population for the membership of certain of the learned societies in the United States. The method used is essentially that of the Bureau of the Census in determining the center of population of the United States, as described on page 20, Volume II, 15th Census of the United States:

> The center of population may be said to represent the center of gravity of the population. If the surface of the

United States be considered as a rigid level plane without weight and the population distributed thereon, all individuals being assumed to have equal weight, the point on which this plane would balance would be the center of population. This pivotal point would be the center of gravity of the hypothetical plane; and its location would be affected not only by the numbers of persons on the different parts of the plane, but also by the distance of each individual from the "center."

In making the computations for the location of the center of population it is necessary to assume that the center is at a certain point. Through this point a parallel and a meridian are drawn, crossing the entire country. In making the computations for 1930, the same point was selected as in 1920; this intersection is assumed to be where the parallel of 39 degrees north latitude intersects the meridian of 86 degrees west longitude, which lines were taken as the axes of moments.

The product of the population of a given area by its distance from the assumed parallel is called a north or south moment, and the product of the population of the area by its distance from the assumed meridian is called an east or west moment. In calculating north and south moments the distances are measured in minutes of arc; in calculating east and west moments it is necessary to use miles, on account of the unequal length of the degrees and minutes in different latitudes. The population of the country is grouped by square degrees—that is, by areas included between consecutive parallels and meridians—as they are convenient units with which to work. The population of the principal cities is then deducted from that of the respective square degrees in which they lie and treated separately. . . . The population of each square degree north and south of the assumed parallel is multiplied by the distance of its center from that parallel; a similar calculation is made for the principal cities; and the sum of the north moments and the sum of the south moments are ascertained. The difference between these two sums, divided by the total population of the country, gives a correction to the latitude. In a similar manner the sum of the east and of the west moments are ascertained and from them the correction in longitude is made.

In this study, no attempt was made to use square degrees; rather the latitude and longitude of the stated post-office address of each member were determined as accurately as possible. In the absence of other figures, the data were estimated from a large-scale atlas. This task was in itself no slight one, in one case it required determination of the latitude and longitude of over 2,000 towns and cities.

The selection of the groups studied was somewhat arbitrary. The first group studied was not one of the learned societies, but consisted of all college students in the United States, as listed in the *World Almanac*. In the selection of societies to be studied a very important factor was the availability of a fairly recent membership list. The growing tendency toward stability of the respective centers made it seem probable that the study of other societies of a non-specialized nature would not show marked differences from the results here reported.

In the case of the American Chemical Society, the secretary advised that a complete list of the individual membership was not available for the purposes of this study. The society has 84 local sections scattered throughout the United States. It was assumed that a fair approximation would be obtained by assuming the entire membership of a local section concentrated in the city or at the center of the region for which the section takes its name, and this method was used in this situation. It should be emphasized that this method neglects altogether approximately 2,700 members, who are unattached to any section. This might produce a definite change in the center of population.

Table 1 summarizes the available information regarding the various centers of population studied. The nearest city was interpreted to mean a city of 150,000 or more.

TABLE 1

Organization	Number of individuals	Center of population		Nearest city
		Latitude	Longitude	
College enrolment..	885,282	39°19′	84°45′	Cincinnati
American Chemical Society by sections	17,469	40° 5′	83°49′	Dayton
Geological Society of America	562	39° 1′	87°32′	Indianapolis
American Historical Society	2,926	39°54′	82°13′	Columbus
Mathematical Association of America	1,928	39°32′	84°57′	Cincinnati
American Association of Petroleum Geologists	2,448	35° 6′	98°12′	Oklahoma City
American Physical Society	2,653	40° 1′	83°23′	Columbus
American Psychological Association	2,269	40°15′	83°35′	Columbus
American Association of University Professors..	11,165	39°30′	84°27′	Cincinnati Dayton
American Association for the Advancement of Science	17,141	39°41′	84°10′	Dayton
American Speech Correction Society	206	40°44′	87° 7′	Chicago Indianapolis
American Society of Zoologists	797	40° 5′	83°39′	Columbus Dayton

Obviously, the effect of the western oil fields is felt upon the center of population for the American Society of Petroleum Geologists. For the other groups, however, there is a definite tendency for the centers of population to cluster. In fact, all are found within a rectangle about 200 miles from east to west and about 100 miles from north to south.

It is interesting to note that with the single exceptional case noted, these centers of population tend to

be slightly north and very definitely east of the center of population of the United States, which in 1930 was 39°3′45″ north latitude and 87°8′6″ west longitude. On the other hand, it seems hard to find any national group for which Richmond, Va., or even Pittsburgh could be considered "far west." Quite possibly some eastern members fail to realize the size of the United States as a whole.

From one point of view, the ideal place for an annual meeting of one of these societies would be the nearest city to the center of population, for the total number of miles of travel necessary for every member to attend would thus be a minimum. From this point of view, it would certainly seem that Columbus and Cincinnati are excellent convention cities.

The writer wishes to acknowledge his indebtedness to students working under the National Youth Administration, without whose help in the routine details this study would have been impossible.

CECIL B. READ

UNIVERSITY OF WICHITA

A NEW DISEASE OF SNAP BEANS

IN June of 1938 while the writer was making a disease survey of his hybrid progenies and varieties of snap beans in connection with a bean-breeding program, he discovered a very destructive disease which has not previously been described. During the present growing season the disease has again appeared and is even more destructive than during 1938.

The end result of this disease is a severe chlorosis followed by wilt and death of the host. Perhaps the most characteristic symptom of the disease throughout its course is a pronounced deep brown to black discoloration of the inner phloem and outer xylem of the entire plant. Of course, the extent of vascular discoloration varies with the extent and severity of infection.

When severely infected, the roots appear dark gray to black on the exterior, due to the intense discoloration of the vascular elements. Symptoms on the upper hypocotyl and stem appear as longitudinal streaks or stripes of varying width, varying in color from brown to brownish purple due to the masking effect of the chlorenchyma. The only external symptoms on infected pods is the presence of a brownish purple discoloration of one or both sutures, which might easily be mistaken for a slight anthocyanescence. In cross sections of infected pods few to all the vascular bundles are discolored, depending on the extent of infection. The chlorenchymatous pulp of severely infected young pods often presents an "inky" appearance.

This disease takes its greatest toll about blossoming time. Although some less severely infected plants survive and mature seed, fatalities are extremely high.

Numerous attempts to isolate a causal organism in culture have consistently failed. This fact, combined with other data at hand, indicates that the disease is caused by a virus. Certain experiments indicate that the virus has a long incubation period, since plants from seed taken from infected pods remain apparently healthy until about blossoming time.

Further work on the etiology of the disease is in progress. From our records we find indications that the disease was brought in on western-grown seed. This note is being published with the hope that persons noting a disease with the above described syndrome will report to the writer.

WILBERT A. JENKINS

GEORGIA EXPERIMENT STATION

GENERAL ANESTHESIA BY CHILLING

THE use of ether, chloretone and other drugs as anesthetics preparatory to operating on lower animals is often objectionable because of the after-effects of the drugs. This difficulty can be overcome by the use of low temperatures for stupefaction. Fishes, amphibians and reptiles may be conveniently and fully anesthetized by immersion in water and cracked ice or simply in cracked ice. After ten to fifteen minutes in the cooling mixture the animals are fully stupefied and, if they are laid out on cracked ice, they may be subjected to an extended and uninterrupted operation. Recovery is quick and satisfactory at the ordinary temperature of the laboratory, and the animals so treated may be almost at once tested in a particular way without waiting for the gradual disappearance from their systems of an anesthetizing drug. This method has been applied with success in the Harvard Laboratories to salt-water and fresh-water fishes, to amphibians and to reptiles. Wiesner (1935) appears to have been the first to use it. Both he and Pfeiffer have applied it to new-born rats. Whether it will have any operative significance for adult, warm-blooded vertebrates remains to be seen. Press reports of a kind of cold hibernation induced in human beings by a slight lowering of their bodily temperatures is suggestive of such a step.

G. H. PARKER

HARVARD UNIVERSITY

SCIENTIFIC BOOKS

RECENT BOTANICAL BOOKS

The Stapelieae. By ALAIN WHITE and BOYD L. SLOANE. 3 vols. xvi + 1186 + 23 + 23 pp. 1,233 + figs. + xxxix plates + 2 maps. 2nd edition. Pasadena: Abbey San Encino Press. 1937. $12.50.

SINCE the Stapelias are found only in the eastern

hemisphere, they have hardly received due consideration in our general concepts of xerophytic plants. Extending from India and Ceylon to Spain, and south to Cape Province in southern Africa, this group of twenty genera is widely spread, though South Africa is spoken of as "the broad paradise of the Stapelieae."

The treatment of the distribution of this tribe of Asclepiads, the discussion of the history of previous work on the group, the descriptions of the twenty genera and all the known species, the copious and beautiful illustrations, thirty-nine in full-page color plates, and the mass of pertinent data assembled about these plants make these three volumes a monumental compendium of information on this unique alliance. They will prove invaluable to the specialist. In *Caralluma* 105 species are given, in *Stapelia* 99, in *Huernia* 45, while *Frerea, Drakebrockmania, Stapeliopsis, Diplocyatha, Hoodiopsis* and *Luckhoffia* are monotypic.

The normal tremor that accompanies the opening of a volume essentially taxonomic is rightly lacking in the case of "The Stapelieae." The general botanist as well as the layman can read this work with pleasure and with profit. Even a partial study and an examination of the excellent figures leave the reader with a distinct impression of the group, with its succulent, rather spiny, photosynthetic stems—only the genus *Frerea* has fleshy leaves—its striking, mottled, showy, flesh-colored, rather complex flowers and its silky-haired seeds. The authors tell us that "the ability of Stapeliads to attract desert flies and a predisposition to succulence were doubtless principal factors in enabling the tribe to dwell in the semi-arid societies they frequent."

Those who study "The Stapelieae" should gain a knowledge and an appreciation of these Asclepiads. Most of us will never have an opportunity of finding them in their native habitats, and many of the genera and species are not often seen in cultivation. These books therefore fill a real need; reading them is almost as satisfactory as studying the plants in the field, though the reader will wish all the more that he might do both.

It is also distinctly refreshing to come upon a work that seems so free of the usual restrictions on pagination and on quality of reproduction. These three volumes give every indication of being exactly what the authors wished them to be; neither effort nor expense has been spared. Such books are lasting.

A Textbook of General Botany. By RICHARD M. HOLMAN and WILFRED W. ROBBINS. xvii + 664 pp. 482 figs. 4th edition. New York: John Wiley and Sons. 1938. $4.00.

FOUR years have elapsed since the publication of the third edition of this justly popular book, and although a number of changes have been made in the new edition, they are not really basic alterations. In format, in style and in contents—even to most of the details—the fourth edition parallels the third closely, and thus maintains the high standards and effectiveness of its predecessors.

The first half of this book deals with the structure and physiology of seed-bearing plants. In this the usual material on stem, root, leaf and flower is presented, along with a concise treatment of the functions of each. In the second half the groups of the plant kingdom are taken up; theories of evolution, heredity and fossil plants are also ably discussed.

In the fourth edition certain changes have been made. There is greater emphasis on active solute absorption, the part on conduction has been altered, the tissue classification has been revised. In the previous edition the plant kingdom was divided into the Thallophyta and Embryophyta; the new book suggests also an alternative grouping in which the vascular plants or Tracheophyta are composed of Psilopsida, Lycopsida, Sphenopsida and Pteropsida. A glossary has been added, and the list of books for reference and collateral reading has been brought up to date.

The new edition has 482 figures, compared with 46[illegible] in the third; the additional illustrations are largely half-tones of photographs or of photomicrographs, and some of the old figures have also been replaced. Most of the original excellent drawings and diagrams have been kept, however.

This text is outstanding in the ease with which it can be studied and in the diagrammatic clarity with which the material is presented. It is still the answer to a freshman botanist's prayer.

An Introduction to Botany. By ARTHUR W. HAUPT. xii + 396 pp. 278 figs. New York and London: McGraw-Hill Book Company. 1938. $3.00.

A NEW text-book of botany, added to the volumes recently printed, some of which are still moist, should bear certain marks of distinction to warrant its publication; these are happily not wanting in "An Introduction to Botany."

The author has digested and presented clearly and concisely the rich botanical heritage of the past several generations. There are adequate discussions of the structure, physiology, reproduction and heredity of plants, while six chapters, covering 113 pages, are devoted primarily to their evolutionary development. Thus the usual material of botanical texts is included, though the sequence in certain cases departs from the traditional.

More striking for an elementary book is the chapter on environmental relations, which reflects the growing emphasis of the biological sciences on ecology. Here the elementary student can gain an acquaintance with

the floristic regions of North America, as well as a conception of the characteristic associations and successions. Structural adaptations to the factors of the environment are not neglected, and such time-honored topics as saprophytism, parasitism and symbiosis are given due consideration.

Indicative of the modern trend to consider biological science from some of its broader aspects—from without as well as from within—are three chapters, one on "The Principles of Evolution," one on "The Causes of Evolution" and one on "Plant Life of the Past." These cut across the subject-matter of various fields and leave the reader with an inkling, at least, of the magnitude of the organic world.

Some will wish, perhaps, that the author had entrusted to his students more of the choice bits of the results of modern research, even though such findings may not be destined for eternity; but that is largely a matter of individual preference, and this book, intended primarily for a one-semester course, is necessarily limited in length.

The illustrations are superior—clear and convincing, artistically prepared and largely original.

The author aims "to introduce the college student to the science of plant life"; this he does, admirably.

General and Economic Botany. By ERNEST ELWOOD STANFORD. xxix + 675 pp. 436 figs. New York and London: D. Appleton-Century Company. 1937. $4.00.

SINCE the subject-matter of botanical science continually increases, the text-book extract prepared for student consumption tends to become more and more concentrated. There is a feeling of luxury, therefore, in opening a volume like this, that exceeds somewhat the usual limitations on length and that offers the reader a glimpse of some of the more interesting and humanly important features of this field of endeavor. "General and Economic Botany" covers the subject-matter included in the standard texts somewhat more fully than usual. There are chapters on cells and tissues, the morphology of leaves, stems, roots and flowers; the functions of these parts of the plant are largely woven into these same chapters, although fifty-seven pages are set aside for "The Seed Plant and Its Environment."

The plant kingdom is divided into the Thallophyta and the Embryophyta, the former being subdivided into the Schizophyta, Phycophyta and Mycophyta, while the latter includes the Bryophyta, Pteridophyta and Spermatophyta.

The seed plants are obviously the author's forte, as might be expected in a book placing emphasis on the economic aspects of the subject. One hundred and forty-four pages are devoted to the groups of the Angiosperms alone. Our more common and important orders and families are considered carefully, along with a considerable number of those more characteristic of the tropics.

Within the covers of this volume information is assembled on a wide variety of botanical topics. Most of our other general texts, for example, contain little or nothing on such items as glutathione, phyllodia, kapok, marihuana, dulse, rainfall and erosion areas of the United States and countless other subjects here included.

The broad basis on which this work is fashioned is reflected also in the 436 illustrations, not a few of which are original, though many have been culled from a wide variety of sources. The lack of uniformity in the figures is more than offset by their diversity of origin and by the scope of the subjects that they portray.

Specialists in particular fields will undoubtedly find shortcomings and inaccuracies. They are almost inevitable in a book of this breadth prepared by one man. From its very scope it lacks the unity of a more compact treatise—it suggests the banyan tree rather than the Colorado blue spruce.

The author writes that his aim is "to introduce the student to one great area of the biological world as a larger place to live in, rather than to train botanists to join an overcrowded profession." If those who study this book are willing to contribute some leisure and some meditation, he will succeed, and they will profit.

EDWIN B. MATZKE

COLUMBIA UNIVERSITY

SPECIAL ARTICLES

ADSORPTION OF ANTIBODIES BY EGG ALBUMIN FILMS

THE possibility of demonstrating immunological reactions with films on a water surface, or those transferred on to metal plates by the Langmuir technique has been dealt with in several recent papers.[1] We have carried out experiments with solutions of crystallized hen egg albumin and anti-egg albumin rabbit sera. Films were deposited under a pressure of 12 dynes/cm on chromium-plated slides covered with 37 to 51 layers of barium stearate. Increments of thickness were followed optically as described by Blodgett and Langmuir.[2] Polarized sodium light was used as source of illumination and the value 1.495 was assumed for the index of refraction of the proteins. When a 1 per

[1] *Cf.* E. F. Porter and A. M. Pappenheimer, *Jour. Exp. Med.*, 69: 755, 1939; M. F. Shaffer and T. H. Dingle, *Proc. Soc. Exp. Biol. and Med.*, 38: 528, 1938.

[2] K. B. Blodgett and J. Langmuir, *Phys. Rev.*, 51: 964, 1937.

cent. solution of ovalbumin was applied to two monolayers of immune serum (thickness of double layer 25A) there was an increase in thickness of about 35A, but the same increase was seen with normal rabbit serum. Experiments were also made with plates coated with monolayers of sera on which monolayers of ovalbumin were deposited, or *vice versa*. Here likewise no difference was found in the behavior of immune and normal sera. On the other hand, when the slides were first coated with one or two layers of spread

TABLE 1

Number of layers of ovalbumin	Total thickness ovalbumin	Serum applied	Increase in thickness
	(A)		(A)
2	20	Anti-ovalbumin, No. 1	50
2	18	" " No. 2	58
2	19	" " " "	49
1 (down) ..		" " " "	50
2	16	" " No. 3	41
2	16	" " " "	41
2	14	" " No. 4	40
2	18	" " " "	55
1 (down) ..	9	" " " "	45
1 (down) ..	9	" " " "	46
2	17	" horse serum No. 1	5
2	19	" " " " "	7
2	21	" " " No. 2	5
2	15	" chicken serum	14
2	16	" " "	14
2	22	" Pneumococcus I	7
2	15	" " "	7
2	17	" guinea pig red cells	6
2	18	" " " " "	12
2	15	" horse red cells	15
2	10	" " " "	15
2	22	normal No. 1	4
2	16	" " "	7
2	20	" No. 2	2
2	21	" No. 3	—
2	17	" No. 4	7

ovalbumin and then (undiluted) immune serum applied to the plate for 3 minutes, a specific effect was observed (see Table 1) as in the work of Porter and Pappenheimer with pneumococcus polysaccharide. In the experiments summarized in Table 1, made with various immune and normal rabbit sera, an interval of 20 minutes was observed between initial spreading and transfer of the film, in order to allow time for unfolding. The increase in thickness following the application of an immune serum was the same whether there were two layers or one layer of egg albumin. The differences between the adsorbed layers of various heterologous antisera call for further investigation.

It would appear therefore that thin films (9 A) of protein are still capable of reacting with antibodies while, as has been reported by Danielli, Danielli and Marrack,[3] the reactivity of antibodies is destroyed by unfolding of the molecule. The experiments of these authors, unlike ours, were made with purified antibody and are free from the objection, prevailing in the case of whole antiserum, that the films may contain too small a proportion of antibody.

[3] J. F. Danielli, M. Danielli and J. R. Marrack, *Brit. Jour. Exp. Path.*, 19: 393, 1938.

The available observations on antibody films and inactivation of antibodies by denaturing agents lend support to the view that the specific reactivity of antibodies is to a large extent dependent upon structures different from those which mainly determine the specificity of antigens.[4, 5]. In this connection reference ought to be made to the theory of Mirsky and Pauling[6] on the structure of proteins, according to which proteins owe characteristic specific properties to the folding of the polypeptide chain "into a uniquely defined configuration . . . held by hydrogen bonds. . . ." Pointing in the same direction as the above evidence is the puzzling fact that an unlimited number of different antibodies can be produced, all having the same chemical characteristics of serum globulins; one idea to be considered among others is the possibility of different ways of folding of the same polypeptide chain.

In experiments made with plant haemagglutinins (*cf.* 7), it was seen that monolayers of bean agglutinin (phasin) of a thickness of 9 A, or double layers dipped for a short time in a suspension of washed horse blood, became covered with red cells in a homogeneous single layer which was not removed by repeated rinsing with saline solution. The agglutinin used was a purified preparation showing only a single boundary when examined by the method of Tiselius.[7] A similar result was obtained with a partially purified agglutinin of castor beans, swine blood being used. For reasons not yet known this conspicuous reaction was not regular, the coating with blood cells being often sparse or spotty. If the plant agglutinins actually are relative in the unfolded state, in apparent contrast to antibodies, this might be connected with the low specificity of these reactions.[8] However, no definite conclusions can as yet be drawn from these observations, particularly in view of the possibility of errors in the interpretation of this sort of experiments, recently emphasized by Langmuir and Schaefer.[9] After this communication had been completed there appeared a paper by L. A. Chambers[10] concerning films of a nucleoprotein antigen.

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[4] K. Landsteiner and J. van der Scheer, *Jour. Exp. Med.*, 67: 709, 1938.

[5] J. R. Marrack, IV Congresso Internazionale, Rome, 1939, Vol. I, p. 347.

[6] A. E. Mirsky and L. Pauling, *Proc. Nat. Acad. of Sciences*, 22: 439, 1936.

[7] L. G. Longsworth and D. A. MacInnes, *Chem. Rev.*, 24: 282, 1939.

[8] K. Landsteiner, "The Specificity of Serological Reactions," 1936, Chas. C Thomas, Springfield, Ill.

[9] J. Langmuir and V. J. Schaefer, *Chem. Rev.*, 24: 199, 1939.

[10] L. A. Chambers, *Jour. Immunology*, 36: 543, 1939.

ABSORPTION SPECTRUM OF FURTHER PURIFIED CYTOCHROME C

As shown previously,[1, 2, 3] cytochrome c may be prepared from beef heart with an iron content of 0.34 per cent. This product, arrived at by different methods, was till now considered as pure. However, a thorough investigation of the cytochrome c by means of *Tiselius* electrophoretic apparatus revealed the possibility of a further purification. If electrophoresis experiments are carried out at pH = 10.5 (*i.e.*, higher than the isoelectric point of the cytochrome) two moving boundaries on each side of the U-tube appear, a colorless component migrating faster than the cytochrome. After complete removal of the colorless component, the cytochrome c had an iron content of 0.41 per cent. A further purification by means of electrophoresis at pH 7.3 raised the iron content to 0.43 per cent., corresponding to a molecular weight of 13,000. This value is definitely lower than one fourth of the molecular weight of the hemoglobin. The purified cytochrome c, contrary to the unpurified one, migrated in the electrical field as a homogeneous substance at all pH values investigated.

The purification had no influence upon the absorption spectrum in the visual region. The oxidized cytochrome shows different absorption bands, depending on the pH of the solution.[2] A reinvestigation of the visual part of the spectrum now revealed some new absorption bands and the existence of *four different forms* of the ferri-cytochrome c:

TABLE 1

Type	pH	Bands, mμ	Color of the solution	Dissociation constant, pK′
I ..	1	627; (540–490)	brown	I– II: 2.5
II ..	4–8	695; 560; 540–515	brownish red	II–III: 9.5
III ..	11	507–545	red	III– IV: 12.7
IV ..	14	570; 530	brownish red	

The different types change reversibly one into another by changing the pH. A quantitative investigation, carried out by means of photoelectrical light absorption and pH measurements, showed that the different types go over one into another along common dissociation curves.

Solutions of an intermediate pH, types I and II both being present, were analyzed by means of the difference in light absorption at 530 mμ, $\beta_{I,\,530} = 1.82 \times 10^7$; $\beta_{II,\,530} = 2.68 \times 10^7$. The other curves were determined in an analogous manner at 650 mμ. The relative

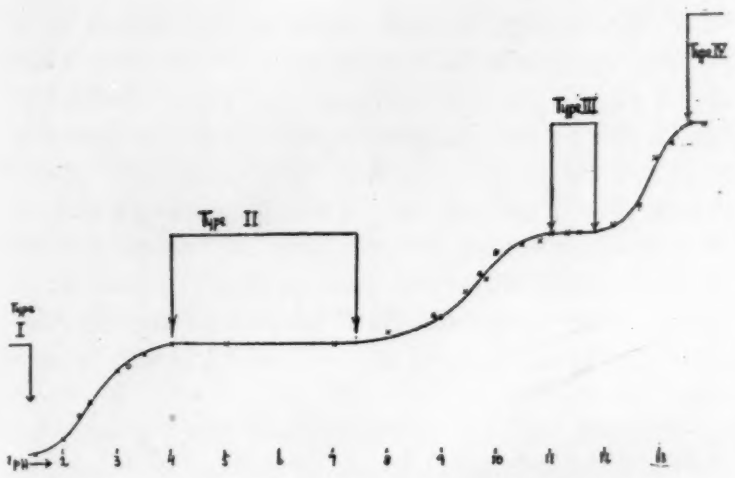

FIG. 1

amounts of the different types were plotted against the pH (Fig. 1).

The great stability of the cytochrome c, even at extreme pH values, depends very probably on the strong linkage of the protein component to the 2- and 4-standing side chains of the hemin.[4, 5] The authors hope that determinations of the magnetic properties of the iron atom in the four different types of the ferri-cytochrome c will give further evidence on the constitution of the cytochrome c.

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[1] Theorell, *Biochem. Zeits.*, 279: 463, 1935.
[2] *Ibid.*, 285: 207, 1936.
[3] Keilin and Hartree, *Proc. Roy. Soc., London*, B, 122: 298, 1937.

SODIUM CHLORIDE AND DIABETES INSIPIDUS

IT has been noted that the abnormally large fluid exchange of experimental diabetes insipidus (d.i.) varies directly with the amount of food the animal ingests.[1] In fasting and in sickness (and therefore probably anorexia), d.i. largely subsides.[2, 3, 4] By varying the NaCl intake of rats, in which d.i. had been experimentally produced by removal of the posterior hypophysis, we have found that the severity of the condition varies directly not with the intake of food in general but rather with the intake of the NaCl in the food. An NaCl-low diet[5] was used alone or to it were added known quantities of NaCl. Reduction of the daily NaCl intake (but not the total intake of food) from 250 mgms to 1.3 mgms caused a reduction of the daily fluid intake from the d.i. level of 60 cc to 25 cc. Equivalent results are obtained by fasting d.i.

[4] Theorell, *Biochem. Zeits.*, 298: 242, 1938.
[5] *Ibid.*, in press.
[1] C. P. Richter, "The Pituitary Gland," Baltimore, 1938.
[2] P. Bailey and F. Bremer, *Arch. Int. Med.*, 28: 773, 1921.
[3] G. M. Curtis, *Arch. Int. Med.*, 34: 801, 1924.
[4] C. Fisher, W. R. Ingram and S. W. Ranson, *Arch. Neurol. and Psychiat.*, 34: 124, 1935.
[5] E. Orent-Keiles, A. Robinson and E. V. McCollum, *Am. Jour. Physiol.*, 119: 651, 1937.

rats. Conversely, in both types of experiment it is possible to cause a full return of the d.i. by giving 250 mgms of salt per day without any food. Similarly, excess NaCl administration is well known profoundly to aggravate an existing d.i.[6] All the above experiments were done with rats in the permanent phase of d.i. We have found, however, that the transient phase is not dependent on the rate of NaCl ingestion; it occurs even though the NaCl content of the diet has been previously reduced or, as is well known, in fasting.

Although the rate of ingestion of NaCl greatly influences the permanent phase of d.i., we do not think it exclusively responsible for the condition. If the NaCl intake is reduced to zero by fasting, a degree of d.i. still recurs at the time of the onset of the permanent phase. At this time, the fluid exchange of the d.i. animals rises to about three times normal, as contrasted with seven times normal when such animals are fed. In d.i. rats, therefore, a large portion of the abnormal fluid exchange which commences with the permanent phase can be ascribed to the return of the animal's appetites with consequent ingestion of NaCl in the animals' food.

Using Richter's[7] technique for determining appetites in the rat during deficiencies of various kinds, we have also found that there is in d.i. in the rat a considerable appetite for salt. Diabetic rats ingest approximately three times the quantity of salt that the normal rat ingests when given a choice between water and physiological saline to drink.

Summary: The severity of permanent diabetes insipidus in the rat is directly related to the amount of NaCl ingested; if little or no NaCl is taken in, the condition exists in only a mild form. The effect of fasting on diabetes insipidus can be attributed to the withdrawal of NaCl rather than to the withdrawal of food in general. Also, the diabetic rat shows a considerable appetite for NaCl. These findings, coupled with the fact that the diabetic animal is abnormally sensitive to NaCl administration, suggest that in diabetes insipidus the primary defect is some abnormality in NaCl metabolism.

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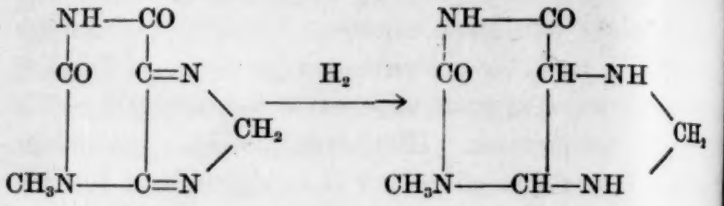
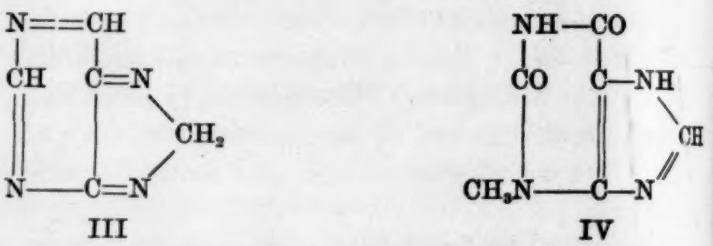
THE ATTEMPTED HYDROGENATION OF 3-METHYLXANTHINE[1]

THE observation by vanVeen and coworkers that *toxoflavin* $C_6H_6O_2N_4$ (I), the highly toxic substance produced by the bacterial action of *Bacterium cocovenenans* on certain food products originating in the commercial production of cocoanut oil in Java,[2] is reduced catalytically in the presence of platinum oxide to a purine containing a saturated glyoxaline ring (II), stimulated the authors to investigate the behavior of 3-methylxanthine (IV) on catalytic reduction.



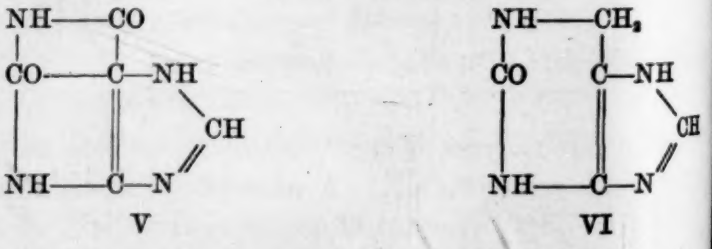
I II

The graphical formula (I) proposed by vanVeen to express the structure of *toxoflavin* is isomeric with that of 3-methylxanthine (IV), and is the first representative of the desmotropic formulation for purine (III) to be described in the chemical literature.



III IV

It is a well-known fact that xanthine (V), 3-methylxanthine (IV) and several other alkylated xanthines undergo reduction electrolytically[3] with absorption of hydrogen at the 6-position of the purine cycle. This treatment leads to the hydrogenation of the carbonyl group (CO) to a methylene radical (CH_2) and formation of a desoxypurine derivative (VI). There was no attack by hydrogen on the imidazole cycle of the purine nucleus of the various xanthine compounds subjected to this electrolytic technique of reduction. Uric acid is also reduced in a similar manner.[4]



V VI

The authors now desire to report that it has been their experience that both xanthine (V) and 3-methylxanthine (IV) are extremely resistant to structural changes when subjected to hydrogenation in the pres-

[6] H. G. Swann, *Endocr.*, 24: 253, 1939.

[7] C. P. Richter, *Endocr.*, 21: 50, 1937; *ibid.*, 22: 214, 1938.

[1] Researches of pyrimidines, CLXII.

[2] vanVeen and Mertens, *Rec. trav. chim.*, 53: 402, 1934; vanVeen and Baars, *Kononklijke Akad. Wetenschappen Amsterdam*, 40: 6, 1937; vanVeen and Baars, *Rec. trav. chim.*, 57: 248, 1938.

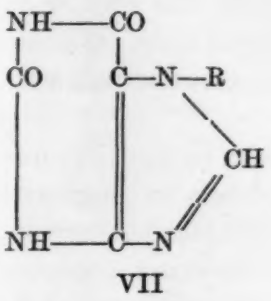
[3] Tafel and Weinschenk, *Ber.*, 33: 3370, 1900; Tafel and Ach, *Ber.*, 34: 1166, 1901. See also Johnson, "The Chemistry of Pyrimidines, Purines and Nucleic Acids," Gilman's "Organic Chemistry," Volume II. John Wiley and Sons, Inc., New York City, New York, 1938.

[4] Biltz, *Jour. pr. Chem.*, 145: 83, 1936.

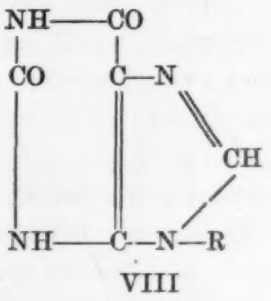
ence of certain catalysts. Both purines, suspended in glacial acetic acid, were recovered unaltered after exposure to hydrogen gas for 8 hours in the presence of Adam's platinum catalyst and under 1.5–2.0 atmospheres pressures. Reduction experiments were also applied by substituting absolute alcohol for glacial acetic acid as solvent and shaking in an atmosphere of hydrogen gas in presence of Raney nickel as the catalyst, under 160–200 atmospheres pressure at 200° for 10 hours. Both purines were partially destroyed by this treatment. In the case of 3-methylxanthine 60 per cent. of the purine was recovered unaltered. Its identity was established by the results of analysis (calc. for $C_6H_6O_2N_4$: N, 33.72 per cent. Found, N, 33.60 per cent.) and by conversion to caffeine by alkylation according to the directions of Emil Fischer.[5]

Exposure of xanthine (V) to catalytic hydrogenation at different hydrogen pressures and temperatures in the presence of copper-chromium-oxide catalyst led to such extensive decomposition of the purine that this reduction technique proved to be of no value and consequently was not applied with 3-methylxanthine. In none of our experiments did we obtain any evidence of the reduction of carbonyl to methylene in position —6, or any hydrogenation of the unsaturated imidazole nucleus of the xanthine molecule. These results are in marked contrast to those reported for *toxoflavin* (I) when exposed to the action of hydrogen under similar experimental conditions.

The resistance of hydrogenation of 3-methylxanthine (IV) is in accordance with the behavior of imidazoles which have previously been investigated. Although 2,4,5-triphenylimidazole[6] (lophin) is reduced with difficulty in the presence of platinum black[7] to 2,4,5-tricyclohexyl-4,5-dihydroimidazole, and 2,4,5-triphenyl-4,5,-dihydroimidazole to this same dihydro-derivative and finally to 2,4,5-tricyclohexylimidazoline, the same experimental conditions were ineffective when applied to imidazole itself, 2,4,5-trimethylimidazole, histidine, lysidine and to benzimidazole. The authors were also unable to hydrogenate benzimidazole-benzimide with Adam's platinum, Raney nickel or copper-chromium-oxide catalysts. It will be of interest to determine whether isomers of the xanthine (VII) and isoxanthine (VIII) types will differ in their behavior on catalytic reduction.



VII



VIII

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research assistant, 1938–39
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SCIENTIFIC APPARATUS AND LABORATORY METHODS

LABELING MUSEUM SPECIMENS

To workers engaged in museum or natural science activities the labeling of specimens is generally a necessary but time-consuming task. A quick and efficient method is always sought. The writer has developed a method which has proved to be very satisfactory.

The complete series of symbols to be used are hand-printed with black drawing ink or typed on strips of tough white or brown gummed paper. Brown or Cellophane "Scotch" tape may be used if the symbols are to be hand-printed, but the tape does not make as satisfactory a label as the gummed paper. Sufficient space is left between the symbols to permit cutting to the desired size. When completely marked the individual labels are cut from the strips. The single label is moistened on the gummed side and fastened to the specimen by a little pressure. A perfect attachment at this stage is not necessary as it serves only to hold the label while the "varnish" is being applied. By the time a number of labels have been attached to their respective specimens the first ones are entirely dry and are ready for the "varnish." A coating of Cenco Label Varnish[1] is applied so as to cover the paper label and to overlap about one sixteenth to one eighth of an inch on the adjacent portion of the specimen. The overlap serves as a seal of attachment. The dauber that is attached to the stopper of the bottle is too large and clumsy for this purpose. A small sliver of wood cut to a chisel end about one eighth of an inch across serves as the best means of application; although a small brush may be used. The "varnish" dries sufficiently upon application to prevent running so that it is not necessary to place the labeled portion of the specimen in better than an approximately horizontal position while drying. The specimens are ready for use in less than an hour but are generally let stand over night.

Recently two articles in this journal[2] described other

[5] Fischer and Bromberg, *Ber.*, 30: 221, 1897.

[6] Waser and Gratsos, *Helv. Chim. Acta.*, 11: 944, 1928.

[7] Willstatter and Waldschmid-Leitz, *Ber.*, 54: 113, 1921; Waser and Gratsos, *Helv. Chim Acta.*, 6: 200, 1923.

[1] This may be obtained in small bottles from the Central Scientific Company, Chicago, Ill.

[2] E. E. Jacobs and Mary Auten, SCIENCE, 84: 210, 1936; I. P. Tolmachoff, SCIENCE, 84: 464, 1936.

methods of labeling specimens. The first requires the use of an electric stylus and transfer paper. The second employs the more usual materials of quick-drying enamel, turpentine and a fine brush. Although both are excellent methods the author considers the one herein described to have many additional merits to recommend it. The printing or typing of the symbols is done on paper under normal conditions of a typewriter or smooth table top; thus assuring that they will be well formed and legible. All printing or typing can be done at one time. The label and "varnish" are both easily and simply applied. The "varnish" does not smear the symbols. The "varnish" is acid, alkali, alcohol and waterproof, thus permanently preserving the surface of the label in addition to holding it to the specimen. The equipment and materials employed are simple, cheap and easily obtained. The surface of a specimen needs no previous preparation, such as filing a rough surface or etching glass, as the "varnish" will stick to anything.

This method has been in use in the author's laboratory for a number of years. The labels on specimens of fossils and rocks, some with rough and porous surfaces, in constant use in student exercises show no signs of damage after several years' handling.

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A SIMPLE DEMONSTRATION OF THE CONDITIONED RESPONSE

WHILE the technique of establishing a conditioned response is theoretically simple, laboratory manuals usually omit this important principle in their experiments on learning. The reason for the omission is probably to be found in the difficulty encountered in securing unequivocal results within a short space of time by means of equipment ordinarily available.

The writer has regularly employed the following procedure in demonstrating conditioning to groups of students. Because of the ease and speed of the technique, it has been a useful adjunct to lectures on learning. The necessary apparatus includes a golf ball, a screen, consisting of an 8- by 10-inch cardboard clamped to an 18-inch support, and a "clicker" (any device capable of making a sharp click). The subject seats himself by a table upon which he extends his right arm palm downward. The experimenter holds the golf ball in full view about 14 inches above the extended hand and instructs the subject to avoid inhibiting his natural response to the falling ball. Having dropped the ball several times, allowing the subject to withdraw his hand to avoid being hit, the experimenter next drops the ball from behind the screen which is fixed at about the same height. It is important to have the screen so adjusted that the subject has just time enough to respond to the sight of the falling ball. This is the response to be conditioned. The experimenter now makes several clicks from behind the screen as the subject's hand lies extended, and all may observe that the sound by itself elicits no visible withdrawing reaction. At this point the experimenter gives eight to twelve simultaneous presentations of the original and substitute stimuli. This is accomplished by holding the "clicker" in one hand and the ball in the other, both hands being behind the screen. The coordination may take a small amount of practice, but it is easily learned. The click alone is then capable of eliciting the withdrawing reaction. By repeatedly presenting the click without reinforcement from the falling ball, it is possible to demonstrate extinction. A few additional reinforcements can then re-establish the conditioning. Should the subject voluntarily inhibit the conditioned response, the fact may be revealed by dropping the ball without the accompaniment of the auditory stimulus. In this case the ball will strike the extended hand.

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